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[OFFICIAL NOTICE.]

New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF SECRETARY, 26 CENTRAL SQUARE,
EAST BOSTON, MASS., Feb. 8, 1907.

To the Members of the New England Association of Gas Engineers—Gentlemen: The Thirty-seventh Annual Meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, Wednesday and Thursday, February 20th and 21st, 1907. The following papers and topics are to be presented:

"The Present and Growing Need of a Uniform System of Accounts," by Mr. Alex. C. Humpreys, President Stevens Institute.

"Some Commercial Departments in the West," by Mr. E. N. Wrightington, Secretary Boston Consolidated Gas Company.

"Methods of Removing Naphthaline from a 16-Inch Pipe," by Mr. D. F. Burritt, Superintendent Springfield Gas Light Company.

"The Process of Making Incandescent Gas Mantles," by Mr. M. C. Whittaker, Superintendent Welsbach Company, Gloucester, N. J.

"Diagram of Changes in Output, 1890 to 1905," by Mr. S. J. Fowler, Manager Charlestown Gas and Electric Company.

"Some Instances of School Room Lighting," by Mr. N. W. Gifford, East Boston.

"Temperature and Manipulation of Condensing Apparatus," by Members.

Question Box.—What is the function of a hot scrubber? Would such a piece of apparatus be necessary when the condensers exerted a scrubbing as well as a cooling effect on the gas in water gas manufacture? Would such a combined scrubber and condenser more seriously affect the candle power than the usual arrangement?

The most economical way of enriching coal gas?

Is there any successful device for giving a continuous record of CO_2 in water gas manufacture?

In upper connections between generator and carbonator is a dry valve better than one water cooled?

Is it necessary to have a scrubber in water gas manufacture?

Where is the best place to locate a P. & A. condenser in water gas making?

In coal gas making what harm does high temperature on the P. & A. condenser?

All friends of the Association are welcome to its sessions without a formal invitation. The library of the Association is at 715 Tremont Temple. The annual dinner will be held Wednesday evening at 6:30 P. M. Application blanks for membership can be had upon request from the Secretary. Members having subjects for the Question Box will please send them to the Secretary at their earliest convenience.

N. W. GIFFORD, Secretary.

CONGRESS. FEB 19 1907 SMITHSONIAN DEPOSIT.

BRIEFLY TOLD.

THE NEW ENGLAND'S THITRY-SEVENTH MEETING.—Secretary Gifford's current circular clearly indicates a useful technical programme for the 37th meeting of the New England Association of Gas Engineers, and if one may decide fairly from that which one hears frequently, there is no doubt that the sessions will be well attended. A stormy winter has been and is upon us, and gas men need not be told what such atmospheric conditions puts upon them; but of work they do not weary, judging from the testimony given in and about the New York Pine street region since mid-January. The social part of the programme has not in any sense been neglected, as will be surely shown when the

Entertainment Committee unfolds the carefully prepared listings. The only dulling feature all too closely attaching to the meeting lies in the sad, sorrowful knowledge that the grim grip of death was felt so severely. Two well honored of the New England band have gone to their reward, and even though each had attained lives that numbered many years, none were fully prepared to hear of their going with calmness or even without shock. Surely Armington and Allyn were names to conjure by, for in their day and time the gas industry of New England had gone on with giant strides, and both had done much to direct those strides safely along pathways that led to fields of commercial vastness. However, their works are as monuments to their masterfulness and their memories are fraught with that abiding fraternity which impels their survivors to emulate their work well done.

CURRENT COMMENT.—

WE presume that the average user of gas in the beautiful city of Milwaukee, Wis., will not be satisfied altogether with the reports rendered so far this month by Prof. A. S. Mitchell, official gas inspector for the named place. Up to the 10th inst. the Professor found, and so reported, that the average illuminating power of the gas supplied by the Milwaukee Gas Light Company was 17, although the statutes applying permit of the distribution of 16-candle power. Again, the heating power of the gas figured at 635 B.T.U., whereas the legal requirements exact only 600.

RUMORS of important changes in the executive management of the Chicago and St. Louis Companies, respectively, are rife. It is said by those well informed that Mr. E. G. Cowdery, now Vice-President and General Manager of the Laclede Gas Company, is to be elected Vice-President, with the general supervision of its manufacturing and distributing divisions, of the Peoples Gas Light and Coke Company, of Chicago, and that Mr. John I. Beggs, executive head of all the properties of the North American Company in St. Louis, will succeed Mr. Cowdery. In any event, the changes will not become operative until April 1st, on which date Mr. Cowdery's connection with the Laclede Company will terminate, as per existing contract.

THE Western Gas Construction Company has been awarded a contract for the construction of a storage holder up to retaining 750,000 cubic feet for the York (Pa.) Gas Company. The holder is to rest in a steel tank, and is to be completed on or before June 1st.

ON and after April 1st the title of the Johnson-Reynolds Company will be changed to that of the Reynolds Gas Regulator Company. The change is merely in name, for Mr. M. G. Reynolds will continue President and General Manager of the Company, and Mr. C. P. Kenton goes on as Superintendent.

THE Lower Norfolk Coke and Gas Corporation has been organized to operate in Norfolk, Va. Its officers are: President, William Lamb; Secretary, T. C. Jones—Catesby, not Clive, for the second initial. It is capitalized in $600,000.

THE name of the Mayor of Greenville, S. C., is Mahon, and his methods of criticism are of a somewhat explosive, not to say fulminative nature, in proof whereof we submit one paragraph out of a bunch contained in a speech made by him not long ago at a meeting of Greenville's Councilmen. Here it is: "The Greenville Gas, Electric Light and Power Company are nothing but a bunch of highway robbers, if I must say it." This leads us to a couplet of Dryden, who is known to have written "Then first the trembling earth the signal gave, and flashing fires enlighten all the cave!"

"R. D. T.," writing from Pittston, Pa., under date of the 12th inst., said: "Just a week ago Mr. James Moffatt, of the staff of the Pittston Gas Company, in the full possession of the mental and physical forces that go to make a man, became a benedict. His wife formerly signed herself Julia Sheridan, and Rev. Father Croghan tied the not in his calm and ministerial way. Everyone in the black diamond center wishes them the best of good luck."

REGINA, Saskatchewan, proposes to construct a gas plant to be operated on municipal account. This move is to be undertaken on the advice of Mr. Thos. Dunderdale, of Winnipeg.

WITH much regret we chronicle the death of Mr. Samuel Dilwin Pray, since 1870 connected with the Indianapolis (Ind.) Gas Company, and its Secretary since 1890. He died at his home in Indianapolis the morning of the 13th inst., and was in his 54th year, having been born in Clarke county, O., September 20, 1853.

[Continued from Page 227.]

Report of Committee on Electrolysis, Prepared for the American Gas Light Association, and Submitted to the American Gas Institute on Behalf of the Former as a Contribution to the Proceedings of the Latter.[1]

GREAT BRITAIN.—EXHIBIT B.

Regulations made by the Board of Trade under the provisions of Special Tramways Acts or Light Railway Orders authorizing lines on public roads; for regulating the use of electrical power; for preventing fusion or injurious electrolytic action of or on gas or water pipes or other metallic pipes, structures or substances; and for minimizing as far as is reasonably practicable injurious interference with the electric wires, lines and apparatus of parties other than the Company and the currents therein, whether such lines do or do not use the earth as a return.[2]

Definitions.—In the following regulations—

The expression "energy" means electrical energy.

The expression "generator" means the dynamo or dynamos or other electrical apparatus used for the generation of energy.

The expression "motor" means any electric motor carried on a car and used for the conversion of energy.

The expression "pipe" means any gas or water pipe or other metallic pipe, structure or substance.

The expression "wire" means any wire or apparatus used for telegraphic, telephonic, electrical signaling or other similar purposes.

The expression "current" means an electric current exceeding 1,000 part of 1 ampere.

The expression "the company" has the same meaning as in the Tramways Act [Light Railways Order].

REGULATIONS.

1. Any dynamo used as a generator shall be of such pattern and construction as to be capable of producing a continuous current without appreciable pulsation.[3]

2. One of the two conductors used for transmitting energy from the generator to the motors shall be in every case insulated from earth, and is hereinafter referred to as "the line;" the other may be insulated throughout, or may be uninsulated in such parts and to such extent as is provided in the following regulations, and is hereinafter referred to as the "return."

3. Where any rails on which cars run or any conductors laid between or within 3 feet of such rails form any part of a return, such part may be uninsulated. All other returns or parts of a return shall be insulated, unless of such sectional area as will reduce the difference of potential between the ends of the uninsulated portion of the return below the limit laid down in regulation 7.

4. When any uninsulated conductor laid between or within 3 feet of the rails forms any part of a return, it shall be electrically connected to the rails at distances apart not exceeding 100 feet by means of copper strips having a sectional area of at least $\frac{1}{10}$ of a square inch, or by other means of equal conductivity.

5. (*a.*) When any part of a return is uninsulated it shall be connected with the negative terminal of the generator, and in such case the negative terminal of the generator shall also be directly connected through the current indicator hereinafter mentioned, to 2 separate earth connections which shall be placed not less than 20 yards apart.

(*b.*) The earth connections referred to in this regulation shall be constructed, laid and maintained so as to secure electrical contact with the general mass of earth, and so that an electromotive force, not exceeding 4 volts, shall suffice to produce a current of at least 2 amperes from 1 earth connection to the other through the earth, and a test shall be made at least once in every month to ascertain whether this requirement is complied with.

(*c.*) Provided that in place of such 2 earth connections the company may make one connection to a main for water supply of not less than 3 inches internal diameter, with the consent of the owner thereof and of the person supplying the water, and provided that where, from the nature of the soil or for other reasons, the company can show to the satisfaction of an inspecting officer of the Board of Trade that the earth connections herein specified cannot be constructed and maintained without undue expense the provisions of this regulation shall not apply.

1. This report is limited to the consideration of direct current electricity, and is, therefore, contingent upon future developments in the use of alternating current electricity for traction purposes.

2. First made, March, 1894; revised, April, 1903; further revised, July, 1904.

3. The Board of Trade will be prepared to consider the issue of regulations for the use of alternating currents for electrical traction on application.

(*d.*) No portion of either earth connection shall be placed within 6 feet of any pipe except a main for water supply of not less than 3 inches internal diameter, which is metallically connected to the earth connections with the consents hereinbefore specified.

(*e.*) When the generator is at a considerable distance from the tramway the uninsulated return shall be connected to the negative terminal of the generator by means of one or more insulated return conductors, and the generator shall have no other connection with earth; and in such case the end of each insulated return connected with the uninsulated return shall be connected also through a current indicator to 2 separate earth connections, or with the necessary consents to a main for water supply, or with the like consents to both in the manner prescribed in this regulation.

(*f.*) If the current indicator cannot conveniently be placed at the connection of the uninsulated return with the insulated return, this instrument may consist of an indicator at the generating station connected by insulated wires to the terminals of a resistance interposed between the return and the earth connection or connections. The said resistance shall be such that the maximum current laid down in regulation 6 (i.) shall produce a difference of potential not exceeding 1 volt between the terminals. The indicator shall be so constructed as to indicate correctly the current passing through the resistance when connected to the terminals by the insulated wire before mentioned.

6. When the return is partly or entirely uninsulated the company shall in the construction and maintenance of the tramway (*a*) so separate the uninsulated return from the general mass of earth, and from any pipe in the vicinity; (*b*) so connect together the several lengths of the rails; (*c*) adopt such means for reducing the difference produced by the current between the potential of the uninsulated return at any 1 point and the potential of the uninsulated return at any other point; and (*d*) so maintain the efficiency of the earth connections specified in the preceding regulations as to fulfil the following conditions, viz.:

(i.) That the current passing from the earth connections through the indicator to the generator or through the resistance to the insulated return shall not at any time exceed either 2 amperes per mile of single tramway line or 5 per cent. of the total current output of the station.

(ii.) That if at any time and at any place a test be made by connecting a galvanometer or other current indicator to the uninsulated return and to any pipe in the vicinity, it shall always be possible to reverse the direction of any current indicated by interposing a battery of 3 Leclanché cells connected in series if the direction of the current is from the return to the pipe, or by interposing 1 Leclanché cell if the direction of the current is from the pipe to the return.

In order to provide a continuous indication that the condition (i.) is complied with, the company shall place in a conspicuous position a suitable, properly connected, and correctly marked current indicator, and shall keep it connected during the whole time that the line is charged.

The owner of any such pipe may require the company to permit him at reasonable times and intervals to ascertain by test that the conditions specified in (ii.) are complied with as regards his pipe.

7. When the return is partly or entirely uninsulated a continuous record shall be kept by the company of the difference of potential during the working of the tramway between points on the uninsulated return. If at any time such difference of potential between any 2 points exceeds the limit of 7 volts, the company shall take immediate steps to reduce it below that limit.

8. The current density in the rails shall not exceed 9 amperes per square inch.

9. Every electrical connection with any pipe shall be so arranged as to admit of easy examination, and shall be tested by the company at least once in every 3 months.

10. Every line and every insulated return or part of a return, except any feeder, shall be constructed in sections not exceeding $\frac{1}{4}$ of a mile in length, and means shall be provided for isolating each such section for purposes of testing.

11. The insulation of the line and of the return when insulated, and of all feeders and other conductors, shall be so maintained that the leakage current shall not exceed $\frac{1}{1000}$ of an ampere per mile of tramway. The leakage current shall be ascertained daily before or after the hours of running when the line is fully charged. If at any time it should be found that the leakage current exceeds $\frac{1}{4}$ of an ampere per mile of tramway the leak shall be localized and removed as soon as practicable, and the running of cars shall be stopped unless the leak is localized and removed within 24 hours. Provided that where both line and return are placed within a conduit this regulation shall not apply.

12. The insulation resistance of all continuously insulated cables used for lines, for insulated returns, for feeders, or for other purposes, and laid below the surface of the ground, shall not be permitted to fall below the equivalent of 10 megohms for a length of 1 mile. A test of the insulation resistance of all such cables shall be made at least once in each month.

13. Where in any case in any part of the tramway the line is erected overhead and the return is laid on or under the ground, and where any wires have been erected or laid before the construction of the tramway in the same or nearly the same direction as such part of the tramway, the company shall, if required so to do by the owners of such wires or any of them, permit such owners to insert and maintain in the company's line one or more induction coils or other apparatus approved by the company for the purpose of preventing disturbance by electric induction. In any case in which the company withhold their approval of any such apparatus the owners may appeal to the Board of Trade, who may, if they think fit, dispense with such approval.

14. Any insulated return shall be placed parallel to and at a distance not exceeding 3 feet from the line when the line and return are both erected overhead, or 18 inches when they are both laid underground.

15. In the disposition, connections and working of feeders, the company shall take all reasonable precautions to avoid injurious interference with any existing wires.

16. The company shall so construct and maintain their system as to secure good contact between the motors and the line and return respectively.

17. The company shall adopt the best means available to prevent the occurrence of undue sparking at the rubbing or rolling contacts in any place and in the construction and use of their generator and motors.

18. Where the line or return or both are laid in a conduit the following conditions shall be complied with in the construction and maintenance of such conduit:

(*a.*) The conduit shall be so constructed as to admit of examination of and access to the conductors contained therein and their insulators and supports.

(*b.*) It shall be so constructed as to be readily cleared of accumulation of dust or other *débris*, and no such accumulation shall be permitted to remain.

(*c.*) It shall be laid to such falls and so connected to sumps or other means of drainage, as to automatically clear itself of water without danger of the water reaching the level of the conductors.

(*d.*) If the conduit is formed of metal, all separate lengths shall be so jointed as to secure efficient metallic continuity for the passage of electric currents. Where the rails are used to form any part of the return they shall be electrically connected to the conduit by means of copper strips having a sectional area of at least $\frac{1}{16}$ of a square inch, or other means of equal conductivity, at distances apart not exceeding 100 feet. Where the return is wholly insulated and contained within the conduit, the latter shall be connected to earth at the generating station or sub-station through a high resistance galvanometer suitable for the indication of any contact or partial contact of either the line or the return with the conduit.

(*e.*) If the conduit is formed of any non-metallic material not being of high insulating quality and impervious to moisture throughout, the conductors shall be carried on insulators the supports for which shall be in metallic contact with one another throughout.

(*f.*) The negative conductor shall be connected with earth at the station by a voltmeter and may also be connected with earth at the generating station or sub-station by an adjustable resistance and current indicator. Neither conductor shall otherwise be permanently connected with earth.

(*g.*) The conductors shall be constructed in sections not exceeding $\frac{1}{4}$ a mile in length, and in the event of a leak occurring on either conductor, that conductor shall at once be connected with the negative pole of the dynamo, and shall remain so connected until the leak can be removed.

(*h.*) The leakage current shall be ascertained daily, before or after the hours of running, when the line is fully charged, and if at any time it shall be found to exceed 1 ampere per mile of tramway the leak shall be localized and removed as soon as practicable, and the running of the cars shall be stopped unless the leak is localized and removed within 24 hours.

19. The company shall, so far as may be applicable to their system of working, keep records as specified below. These records shall, if and when required, be forwarded for the information of the Board of Trade.

DAILY RECORDS.

Number of cars running; number of miles of single tramway line; maximum working current; maximum working pressure; maximum current from the earth plate or water pipe connections (*vide* regulation 6 (i.)); leakage current (*vide* regulations 11 and 18 (*h.*)); fall of potential in return (*vide* regulation 7).

MONTHLY RECORDS.

Condition of earth connections (*vide* regulation 5); minimum insulation resistance of insulated cables in megohms per mile (*vide* regulation 12).

QUARTERLY RECORDS.

Conductance of joints to pipes (*vide* regulation 9).

OCCASIONAL RECORDS.

Specimens of tests made under provisions of regulation 6 (ii).

BOARD OF TRADE,
August, 1904. 7, Whitehall Gardens, S. W.

GREAT BRITAIN.—EXHIBIT C.—MODEL BILLS AND CLAUSES.

II.—TRAMWAY BILL.

[*Note.*—References to clauses in other model bills are given verbatim, but these other model bills are not reproduced.]

1. The companies clauses consolidation act, 1845, part 1, (relating to cancellation and surrender of shares) of the companies clauses act, 1863, as amended by subsequent acts, the lands clauses acts, and Section 3 (interpretation of terms), part II. (Construction of tramways) and part III. (General provisions) of the tramways act, 1870, are (except where expressly varied by this act) incorporated with and form part of this act.

2. In this act the several words and expressions to which meanings are assigned by the acts wholly or partially incorporated herewith have the same respective meanings unless there be something in the subject or context repugnant to such construction. And in this act unless the context otherwise requires.

"The company" means the company incorporated by this act; "the tramways" and "the undertaking" mean respectively the tramways and other works and the undertaking by this act authorized; "mechanical power" includes electrical and every other motive power not being steam or animal power; "engine" includes motor; "contingencies" in section 122 of the companies clauses consolidation act, 1845, include the contingency of the undertaking being sold to the local authority under section 43 of the tramways act, 1870, at a sum less than the aggregate amount of the capital and debts of the company.

[And in this act and for the purposes of this act in the tramways act, 1870, and the recited acts the expression "local authority" shall mean in reference to a rural district the district council of that district.]

3. [*Incorporation clause; sec. p.* 2.]

Power to Construct.—4. Subject to the provisions of this act *and of parts II. and III. of the tramways act*, 1870, the company may make, lay down, work, use and maintain the tramways hereinafter described, in the lines and according to the levels and within the limits of deviation shown on the deposited plans and sections and in all respects in accordance with those plans and sections, with all proper rails, plates, works and conveniences connected therewith: Provided that nothing in this act shall authorize any interference with electric lines and works of any undertakers under the electric lighting acts, 1882 and 1888, to which the provisions of Section 15 of the former act apply, except in accordance with and subject to the provisions of that section.

The tramways hereinbefore referred to and authorized by this act are:

A tramway (single line).....in length, commencing at..... and terminating at.....

[The standing orders require that the length of each tramway shall be set forth in miles, furlongs, chains and links or yards, or decimals of a chain; also a statement whether the tramway is a single or a double line.]

5. The company may erect, maintain and use, on the lands described in the *first* schedule to this act annexed, a station or stations for producing and generating, transforming, storing and applying electrical power, with all such buildings, engines, batteries, dynamos, accumulators and other plant, machinery, apparatus, works and conveniences as may be necessary or suitable for those purposes, and may produce, generate, transform, store, use and apply such power accordingly.

6. (I.) The company may, in, under or over the surface of the streets or roads in which the tramways by this act authorized will be situate, or in which it may be necessary so to do in order to connect the tramways with any generating station, construct, lay down, erect, maintain, renew and repair electric wires, conductors, posts, tubes, boxes and other electrical apparatus, and may make and maintain openings and ways for the purpose of working the tramways by electrical power, and may for that purpose, subject to the provisions contained in part II. of the tramways act, 1870, and to the provisions of this act, open and break up any such street or road, and any sewers, drains, water or gas pipes, tubes, wires, telephonic and telegraphic apparatus therein or thereunder. Provided, as follows:

(*a.*) All posts and apparatus erected by the company under the powers of this act, in any street or road, shall be of such design as the local authority may approve and shall be placed in such position as the local authority and road authority may approve: Provided that no post or other apparatus shall be erected on the carriageway except with the consent of the Board of Trade.

(*b.*) The route in which any electrical apparatus is to be laid or erected for the purpose of connecting the tramways with a generating station shall be approved by the local authority and the road authority, within whose jurisdiction each portion of the route is situate.

(2.) Nothing in this section shall extend to or authorize any interference with any works of any undertakers within the meaning of the electric lighting acts, 1882 and 1888, to which the provisions of section 15 of the former act apply.

7. When by reason of the execution of any work affecting the surface or soil of any road along or across the carriageway of which any of the tramways are or is laid it shall in the opinion of the road authority be expedient temporarily to remove or discontinue the use of such tramway or any part thereof, the company may, with the consent of the road authority and subject to such conditions as the road authority may impose, construct in the same or any adjacent road and (so long as occasion may require) maintain a temporary tramway in lieu of the tramway or part of the tramway so removed or discontinued.

If any difference arises between the company and the road authority with respect to any conditions or with respect to the mode of constructing any temporary tramway under the authority of this section, the same shall be settled by arbitration under this act.

8. The company may increase the roadway of any street in which any of the tramways are authorized to be laid to such extent as may be necessary to leave a space of 9 feet and 6 inches between the outside of the footpath on each or either side of such street and the nearest rail of the tramway by reducing the width of the footpath on each or either side of such street: Provided that any footpath shall not be reduced in width without the consent of the local authority and the road authority or other person in whom it is vested nor to such an extent as to be less than 6 feet wide.

9. The company may erect and maintain shelters or waiting rooms for the accommodation of passengers, and may with the consent of the local authority and road authority use for that porpose purtions of the public streets or roads.

Mode of Construction Restrictions, etc.

10. (1) The tramway shall be constructed on a gauge of 4 feet 8½ inches or such other gauge as may from time to time be approved by the Board of Trade but carriages or trucks adapted to run on railways shall not be run thereon.

(2) In the event of the tramway being constructed on a less gauge than 4 feet 8½ inches so much of section 34 of the Tramways Act, 1870, as limits the extent of the carriage used on any tramway beyond the edge of the wheels of such carriage shall not apply to carriages used on the tramways, but no carriage or engine shall exceed 6 feet 3 inches in width or such other width as may from time to time be prescribed by the Board of Trade.

11. The rails of the tramways shall be such as the Board of Trade may approve.

12. In addition to the requirements of Section 26 of the Tramways Act, 1870, the company shall lay before the Board of Trade and the road authority a plan showing the proposed mode of constructing, laying down and renewing such tramways, and a statement of the materials intended to be used therein, and the company shall not commence the construction, laying down and renewal of any of the tramways or part of any of the tramways respectively until such plan and statement

have been approved by the Board of Trade, and after such approval the works shall be executed in accordance in all respects with such plan and statement and under the superintendence and to the reasonable satisfaction of the surveyor of the road authority as provided by section 26 of the said Act.

13. (1) The company shall at all times maintain and keep in good condition and repair and so as not to be a danger or annoyance to the ordinary traffic the rails of the tramways *by this Act authorized and of all other tramways of the company* and the sub-structure upon which the same rest, and if the company at any time fail to comply with this provision or with the provisions of section 28 of the Tramways Act, 1870, they shall be liable to a penalty not exceeding £5 and to a daily penalty not exceeding £5. *The tramways of the company for the purposes of this section include any tramways purchased by the company or taken on lease by them during the continuance of any such lease.*

(2) In case it is represented in writing to the Board of Trade by the road authority of any district in which the tramways or any portion thereof are or is situate or by 20 inhabitant ratepayers of such district that the *company* have made default in complying with the provisions in this section contained or with any of the requirements of section 28 of the Tramways Act, 1870, the Board of Trade may, if thought fit, direct an inspection by an officer to be appointed by the said Board, and if the officer reports that the default mentioned in such representation has been proved to his satisfaction, then and in every such case a copy of such report certified by a secretary or an asistant secretary of the Board of Trade may be adduced as evidence of such default and of the liability of the *company* to such penalty or penalties in respect thereof as is or are by this section imposed,

14. If and whenever after the passing of this Act any road authority alters the level of any road along or across which any part of the tramway is laid or authorized to be laid, the *company* may and shall from time to time or (as the case may be) lay their rails so that the uppermost surface thereof shall be on a level with the surface of the road as altered.

15. Any paving metalling or material excavated by the *company* in the construction of the tramways from any road under the jurisdiction or control of any road authority may be applied by the *company* so far as may be necessary in or towards the reinstatement of the road and the maintenance for 6 months after completion of any of the tramways within the district of such road authority of so much of the roadway on either side of such tramways as the *company* are, by section 28 of the Tramways Act, 1870, required to maintain; and the *company* shall if so required deliver the surplus paving metalling or material not used or required to be retained for the purposes aforesaid to the surveyor of the road authority or to such person or persons as he may appoint to receive the same: Provided that if within 7 days after the setting aside of the surplus arising from the excavation of any such paving metalling or material and notice duly given such surplus is not removed by such surveyor or by some other person named by him for that purpose, such surplus paving metalling or material shall absolutely vest in and belong to the *company* and may be dealt with removed, and disposed of by them in such manner as they may think fit. Any difference between the *company* and any road authority or surveyor or other person with reference to any of the matters aforesaid shall be settled by an arbitrator to be nominated by the Board of Trade on the application of either party.

16. Every sanitary authority shall at all times have free access to and communication with all their sewers and drains and power to lay lateral and private drains to communicate therewith without the consent or concurrence of the *company*, and the provisions contained in sections 32 and 33 of the Tramways Act, 1870, shall be applicable in the case of any sewer or private drain of or under the control of the said authority as if the same were a pipe for the supply of gas or water.

17. Where in any road in which a double line of tramway is laid there shall be less width between the outside of the footpath on either side of the road and the nearest rail of the tramway than 9 feet 6 inches, the *company* shall, if and where required by the Board of Trade, construct a cross-over or cross-overs connecting the one tramway with the other and by the means of such cross-over or cross-overs the traffic shall when necessary be diverted from one tramway to the other.

18. The *company* may, subject to the provisions of this Act with the consent of the Board of Trade, make, maintain, alter and remove such cross-overs, passing-places, sidings, junctions and other works in addition to those particularly specified in and authorized by this Act as they find necessary or convenient for the efficient working of the tramways or for providing access to any warehouses, stables or carriage houses or works of the *company*.

(2) Notwithstanding anything shown on the deposited plans the *company* may, with the consent of the Board of Trade, lay down double lines in lieu of single or interlacing lines or single lines in lieu of double or interlacing lines or interlacing lines in lieu of double or single lines on any of the tramways, and may with the like consent at any time alter the position in the road of any of the tramways or any part thereof.

(3) Provided that if in the construction of any works under this section any rail is intended to be laid nearer to the footpath than previously authorized in such a manner that, for a distance of 30 feet or upwards, a less space than 9 feet 6 inches would intervene between it and the outside of the footpath on either side of the road, the *company* shall, not less than 1 month before commencing the works, give notice in writing to every owner and occupier of houses, shops or warehouses abutting on the place where such less space would intervene, and such rail shall not be so laid if the owners or occupiers of ¾ of such houses, shops or warehouses, by writing under their hands addressed and delivered to the *company* within 3 weeks after receiving the notice from the *company*, express their objection thereto.

Use of Mechanical Power.

19. The carriages used on the tramways may be moved by animal power or subject to the following provisions by mechanical power (that is to say):

(1) The mechanical power shall not be used except with the consent of and according to a system approved by the Board of Trade:

(2) The Board of Trade shall make regulations (in this act referred to as "the Board of Trade regulations") for securing to the public all reasonable protection against danger arising from the use under this act of mechanical power on the tramways and for regulating the use of electric power:

(3) The *company*[1] or any [other] company or persons using any mechanical power on the tramways contrary to the provisions of this act or of the Board of Trade regulations shall for every such offence be liable to a penalty not exceening £10 and also in the case of a continuing offence to a further penalty not exceeding £5 for every day during which such offence is continued after a conviction thereof:

(4) The Board of Trade if they are of opinion:

(A) That the *company* or such [other] company or person have or has made default in complying with the provisions of this act or of the Board of Trade regulations, whether a penalty in respect of such noncompliance has or has not been recovered; or,

(B) That the use of mechanical power as authorized under this act is a danger to the passengers or the public; may by order either direct the *company* or such [other] company or person to cease to use such mechanical power or permit the same to be continued only subject to such conditions as the Board of Trade may impose, and the *company* or such [other] company or person shall comply with every such order. In every such case the Board of Trade shall make a special report to Parliament notifying the making of such order.

20. The following provisions shall apply to the use of electrical power under this act, unless such power is entirely contained in and carried along with the carriages:

(1) The company shall employ either insulated returns or uninsulated metallic returns of low resistance:

(2) The *company* shall take all reasonable precautions in constructing, placing and maintaining their electric lines and circuits and other works of all descriptions, and also in working their undertaking, so as not injuriously to affect by fusion or electrolytic action any gas or water pipes or other metallic pipes, structures or substances, or to interfere with the working of any wire line or apparatus from time to time used for the purpose of transmitting electrical power or of telegraphic, telephonic or electric signalling communication or the currents in such wire line or apparatus:

(3) The electrical power shall be used only in accordance with the Board of Trade regulations and in such regulations provision shall be made for preventing fusion or injurious electrolytic action of or on gas or water pipes, or other metallic pipes, structures or substances, and for minimizing as far as is reasonably practical injurious interference with the electric wires, lines and apparatus of other parties and the currents therein, whether such lines do or do not use the earth as a return:

(4) The *company* shall be deemed to take all reasonable precautions against interference with the working of any wire, line or apparatus, if and so long as they adopt and employ at the option of the *company* either such insulated returns or such uninsulated metallic returns of low resistance and such other means of preventing injurious interfer-

1. Or corporation, district council, or as the case may be.

ence with the electric wires, lines and apparatus of other parties and the currents therein, as may be prescribed by the Board of Trade regulations, and in prescribing such means the Board shall have regard to the expense involved and to the effect thereof upon the commercial prospects of the undertaking.

(5) At the expiration of 2 years from the passing of this act the provisions of this section shall not operate to give any right of action in respect of injurious interference with any electric wire, line or apparatus, or the currents therein, unless in the construction, erection, maintaining and working of such wire, line and apparatus, all reasonable precautions, including the use of an insulated return, have been taken to prevent injurious interference therewith and with the currents therein by or from other electric currents:

(6) If any difference arises between the *company* and any other party with respect to anything hereinbefore in this section contained, such difference shall, unless the parties otherwise agree, be determined by [arbitration], the Board of Trade, or at the option of the Board, by an arbitrator to be appointed by the Board, and the costs of such determination shall be in the discretion of the Board or of the arbitrator, as the case may be:

(7) When any department of His Majesty's Government represents to the Board of Trade that the use of electrical power under this act injuriously affects or is likely to injuriously affect any instruments or apparatus, whether electrical or not, used in any observatory or laboratory belonging to or under the control of that department, the Board of Trade, after such inspection or inquiry as they may think proper, may by their regulations require the company to use such reasonable and proper precautions, including insulated returns, as the Board of Trade may deem necessary for the prevention of such injurious affection. For the purposes of this sub-section any inspector of the Board of Trade may during his inspection of the company's works and apparatus be accompanied by any person or persons appointed in that behalf by the Government department concerned, and the company shall give all due facilities for the inspection. Provided always that in the case of any observatory or laboratory established after the passing of this act, or of any instruments or apparatus hereafter used in any existing observatory or laboratory which may be of greater delicacy than those used therein at the passing of this act, the Board of Trade shall consider to what extent, if any, it is expedient in the interests of the public that the powers of this sub-section should be exercised, regard being had to the site of the observatory or laboratory or the purposes of the instruments or apparatus, as the case may be:

(8) The expression "*company*" in this section shall include [lessees[1]] licensees and any person owning, working or running carriages over any tramway of the *company*.

21. Notwithstanding anything in this act contained, if any of the works authorized to be executed by this act involves or is likely to involve any alteration of any telegraphic line belonging to or used by the Postmaster-General the provisions of section 7 of the telegraph act, 1878, shall apply (instead of the provisions of section 30 of the tramways act, 1870), to any such alteration.

22.[2] In the event of any tramways of the *company* being worked by electricity the following provisions shall have effect:

(1) The *company* shall construct their electric lines and other works of all descriptions and shall word their undertaking in all respects with due regard to the telegraphic lines from time to time used or intended to be used by His Majesty's Postmaster-General, and the currents in such telegraphic lines, and shall use every reasonable means in the construction of their electric lines and other works of all descriptions and the working of their undertaking to prevent injurious affection whether by induction or otherwise to such telegraphic lines or the current therein. Any difference which arises between the Postmaster-General and the *company* as to compliance with this sub-section shall be determined by arbitration:

(2) If any telegraphic line of the Postmaster-General is injuriously affected by the construction by the *company* of their electric lines and works or by the working of the undertaking of the *company*, the *company* shall pay the expense of all such alterations in the telegraphic lines of the Postmaster-General as may be necessary to remedy such injurious affection:

(3) Before any electric line is laid down or any act or work for working the tramways by electricity is done within 10 yards of any part of a telegraphic line of the Postmaster-General (other than repairs), the *company* or their agents not more than 28 or less than 14 days before commencing the work shall give written notice to the Postmaster-General specifying the course of the line and the nature of the work, including the gauge of any wire, and the *company* and their agents shall conform with such reasonable requirements (either general or special) as may from time to time be made by the Postmaster-General for the purpose of preventing any telegraphic line of the Postmaster-General from being injuriously affected by the said act or work. Any difference which arises between the Postmaster-General and the *company* as to any requirement so made shall be determined by arbitration:

(4) If any telegraphic line of the Postmaster-General situate within 1 mile of any portion of the works of the *company* is injuriously affected, and he is of opinion that such injurious affection is or may be due to the construction of the company's works or to the working of the undertaking, the engineer-in-chief of the Post Office, or any person appointed in writing by him, may at all times, when electrical energy is being generated by the *company*, enter any of the company's works for the purpose of inspecting the company's plant and the working of the same, and the *company* shall in the presence of such engineer-in-chief or such appointed person as aforesaid make any electrical tests required by the Postmaster-General, and shall produce for the inspection of the Postmaster-General the records kept by the *company* pursuant to the Board of Trade regulations.[1]

(5) In the event of any contravention of or wilful non-compliance with this section by the *company* or their agents the *company* shall be liable to a fine not exceeding £10 for every day during which such contravention or non-compliance continues, or if the telegraphic communication is wilfully interrupted not exceeding £50 for every day on which such interruption continues:

(6) Provided that nothing in this section shall subject the *company* or their agents to a fine under this section, if they satisfy the court having cognizance of the case that the immediate doing of any act or the execution of any work in respect of which the penalty is claimed was required to avoid an accident or otherwise was a work of emergency, and that they forthwith served on the postmaster or sub-postmaster of the postal telegraph office nearest to the place where the act or work was done, a notice of the execution thereof, stating the reason for doing or executing the same without previous notice:

(7) For the purposes of this section a telegraphic line of the Postmaster-General shall be deemed to be injuriously affected by an act or work if telegraphic communication by means of such line is, whether through induction or otherwise, in any manner affected by such act or work or by any use made of such work:

(8) For the purposes of this section and subject as therein provided, sections 2, 10, 11 and 12 of the telegraph act, 1878, shall be deemed to be incorporated with this act:

(9) The expression "electric line" has the same meaning in this section as in the electric lighting act, 1882:

[(10) Any question or difference arising under this section which is directed to be determined by arbitration shall be determined by an arbitrator appointed by the Board of Trade on the application of either party whose decisions shall be final, and sections 30 to 32 both inclusive of the regulation of railways act, 1868, shall apply in like manner as if the *company* or their agents were a company within the meaning of that act:]

(11) Nothing in this section contained shall be held to deprive the Postmaster-General of any existing right to proceed against the *company* by indictment, action or otherwise in relation to any of the matters aforesaid:

(12) In this section the expression "the *company*" includes their lessees and any person owning, working or running carriages on any of the tramways of the *company*.

23. The provisions of sections 26 to 33 [[2] and 41] of the tramways act, 1870 (except so much of section 28 as relates to the repair of the road between and on each side of the rails of a tramway) shall apply as if all posts, tubes, pipes, wires and other apparatus, used, or to be used by the *company* for the purposes of mechanical power were parts of the tramway.

24. The *company* may, with the consent of the owner of any building, attach to that building such brackets, wires and apparatus, as may be required for the working of the tramways by mechanical power:

Provided that:

(1) Where in the opinion of the *company* any consent under this section is unreasonably refused, they may appeal to a petty sessional court, who shall have power, having regard to the character of the

1. Where the promoters are a local authority.

2. This clause is proper to be used also in the case of above ground railways worked by electricity.

1. Where this clause isapplied to a company having a separate electrical undertaking, this sub-section may be confined to the works "by this act authorized" and to the generation of electrical energy "for the purposes of this act."

2. Reference to Section 41 should be omitted in local authorities' bills.

uilding and to the other circumstances of the case, to allow the attachment subject to such terms as to compensation or rent, and otherwise as they may think reasonable, or to disallow the same, and may determine by which of the parties the costs of the appeal are to be paid:

(2) Any consent of an owner and any order of a petty sessional court under this section shall not have effect after that owner ceases to be in possession of the building, but any attachments fixed under the provisions of this section shall not be removed until the expiration of 3 months after any subsequent owner shall have given to the *company* notice in writing requiring the attachments to be removed. Where such notice is given the preceding provisions of this section shall apply and the petty sessional court shall have the same powers as under pro viso (1):

(3) The owner may require the *company* to temporarily remove the attachments where necessary, during any reconstruction or repair of the building.

For the purpose of this section any occupier of a building whose tenancy exceeds 1 year unexpired and in the case of any other tenancy the person receiving the rackrent shall be deemed to be the owner.

25. Subject to the provisions of this act the Board of Trade may make by-laws with regard to any of the tramways upon which mechanical power may be used for all or any of the following purposes (that is to say):

For regulating the use of any bell, whistle or other warning apparatus fixed to the engine or carriages:

For regulating the emission of smoke or steam from engines used on the tramways:

For providing that engines and carriages shall be brought to a stand at the intersection of cross streets, and at such places and in such cases of horses being frightened, or of impending danger, as the Board of Trade may deem proper for securing safety:

For regulating the entrance to, exit from and accommodation in the carriages used on the tramways and the protection of passengers from the machinery of any engine used for drawing or propelling such carriages:

For providing for the due publicity of all by-laws and Board of Trade regulations in force for the time being in relation to the tramways by exhibition of the same in conspicuous places on the carriages and elsewhere:

Any person offending against or committing a breach of any of the by-laws, made by the Board of Trade under the authority of this act, shall be liable to a penalty not exceeding 40 shillings.

Working by Local Authority.

26. Notwithstanding anything in the tramways act, 1870, to the contrary, the *corporation*[1] may place and run carriages on and may work and may demand and take tolls and charges in respect of any tramways within the *borough* now belonging to the *corporation* or authorized in or prior to the present session of Parliament to be constructed by them, and in respect of the use of such carriages, and may provide such stables, buildings, carriages, trucks, harness, engines, machinery, apparatus, horses, steam, cable, electric and other plant appliances and conveniences as may be requisite or expedient for the convenient working, or user, of the said tramways by animal or mechanical power, but nothing in this section shall empower the *corporation* to create or permit a nuisance.

27. The regulations authorized by the tramways act, 1870, to be made by the promoters of any tramway and their lessees may with respect to any tramways or portions of tramways for the time being belonging to and worked by the *corporation* be made by the *corporation* alone.

Completion.

28. The tramway shall not be opened for public traffic until it has been inspected and certified to be fit for such traffic by the Board of Trade.

29. The tramway shall be completed within 5 years from the passing of this act and on the expiration of that period the powers by this act granted to the company for executing the same or otherwise in relation thereto shall cease, except as to so much thereof as shall then be completed.

Deposit or Penalty.

30. Whereas pursuant to the standing orders of both Houses of Parliament and to the parliamentary deposits act, 1846, a sum of..... stock exchequer bills], being 5 per cent. upon the amount of the estimate in respect of the tramway has been deposited with [transferred nto the name of] the paymaster-general for and on behalf of the Supreme Court [accountant-general of the Supreme Court *in Ireland*] in respect of the application to Parliament for this act (which sum [stock exchequer bills] is [are] referred to in this act as the deposit fund): Be it enacted that notwithstanding anything contained in the said act, the said deposit fund shall not be paid or transferred to, or on the application of, the person or persons or the majority of the persons named in the warrant or order issued in pursuance of the said act or the survivors or survivor of them (which persons, survivors or survivor, are, or is in this act referred to as the depositors), unless the company shall, previously to the expiration of the period limited by this act for completion of the tramway, open the same for the public conveyance of passengers, and if the company shall make default in so opening the tramway, the deposit fund shall be applicable and shall be applied as provided by the next following section: Provided that if within such period as aforesaid the company opens any portion of the tramway for the public conveyance of passengers, then on the production of a certificate of the Board of Trade specifying the length of the portion of the tramway opened as aforesaid, and the portion of the deposit fund, which bears to the whole of the deposit fund the same proportion as the length of the tramway so opened bears to the entire length of the tramway hereby authorized, the High Court shall, on the application of the depositors, order the portion of the deposit fund specified in the certificate to be paid or transferred to them or as they shall direct, and the certificate of the Board of Trade shall be sufficient evidence of the facts therein certified, and it shall not be necessary to produce any certificate of this act having passed anything in the above mentioned act to the contrary notwithstanding.

31. If the company do not, previously to the expiration of the period limited for the completion of the tramway, complete the same and open it for the public conveyance of passengers, then, and in every such case, the deposit fund, or so much thereof as shall not have been paid to the depositors, shall be applicable, and after due notice in the *London Gazette* shall be applied towards compensating any landowners or other persons whose property has been interfered with or otherwise rendered less valuable by the commencement, construction or abandonment of the tramway, or any portion thereof; *or who have been subjected to injury or loss in consequence of the compulsory powers of taking property conferred upon the company by this act*, and also in compensating all road authorities for the expense incurred by them in taking up any tramway or materials connected therewith placed by the company in or on any road vested in or maintainable by such road authorities respectively, and in making good all damage caused to such roads by the construction or abandonment of such tramway, and shall be distributed in satisfaction of such compensation as aforesaid in such manner and in such proportions as to the High Court may seem fit; and if no such compensation is payable, or if a portion of the deposit fund has been found sufficient to satisfy all just claims in respect of such compensation, then the deposit fund or such portion thereof as may not be required as aforesaid shall, if a receiver has been appointed or the company is insolvent and has been ordered to be wound up or the undertaking has been abandoned, be paid or transferred to such receiver or to the liquidator or liquidators of the company or be applied in the discretion of the court as part of the assets of the company for the benefit of the creditors thereof, and subject to such application shall be repaid or retransferred to the depositors: Provided that until the deposit fund has been repaid [retransferred] to the depositors, or has become otherwise applicable as hereinbefore mentioned, any interest or dividends accruing thereon shall, as and when the same become payable, be paid to or on application of the depositors.

[The two following clauses are to be substituted in every bill whereby the construction of any new line of tramway is authorized, or the time for completing any line already authorized is extended, promoted by an existing tramway company which is possessed of a tramway already opened for public traffic, and which has during the year last past, paid dividends on its ordinary share capital, and which does not propose to raise under the bill a capital greater than its existing authorized capital.]

30A. If the company fail within the period limited by this act to complete the tramway and open the same for public traffic, the company shall be liable to a penalty of £50 a day for every day after the expiration of the period so limited until the tramway is completed and opened for public traffic, or until the sum received in respect of such penalty amounts to 5 per cent. on the estimated cost of the works, and the said penalty may be applied for by any road authority, land owner or other person claiming to be compensated or interested in accordance with the provisions of the next following section of this act and in the same manner as the penalty provided in section 3 of the Railway and Canal

1. Or as the case may be.

Traffic act, 1854; and every sum of money recovered by way of such penalty as aforesaid shall be paid under the warrant or order of such court or judge as is specified in that section to an account opened or to be opened in the name of the Paymaster General, for and on behalf of the Supreme Court [the Accountant-General of the Supreme Court in Ireland] in the bank [and to the credit] specified in such warrant or order and shall not be paid thereout except as hereinafter provided, but no penalty shall accrue in respect of any time during which it shall appear by a certificate to be obtained from the Board of Trade that the company was prevented from completing or opening such line by unforeseen accident or circumstances beyond their control, provided that the want of sufficient funds shall not be held to be a circumstance beyond their control.

31A. Every sum of money so recovered by way of penalty as aforesaid shall be applicable, and after due notice in the *London Gazette* shall be applied towards compensating any landowners or other persons whose property may have been interfered with or otherwise rendered less valuable by the commencement construction or abandonment of the tramway or any portion thereof, or who may have been subjected to injury or loss in consequence of the compulsory powers of taking property conferred upon the company by this act, and also in compensating all road authorities for the expense incurred by them in taking up any tramway or material connected therewith, placed by the company in or on any road vested in or maintainable by such road authorities respectively, and in making good all damage caused to such roads by the construction or abandonment of such tramway, and shall be distributed in satisfaction of such compensation as aforesaid in such manner and in such proportions as to the High Court may seem fit; and if no such compensation shall be payable, or if a portion of the sum or sums of money so recovered by way of penalty as aforesaid shall have been found sufficient to satisfy all just claims in respect of such compensation, then the said sum or sums of money recovered by way of penalty or such portion thereof as may not be required as aforesaid shall, if a receiver has been appointed or the company is insolvent and has been ordered to be wound up, or the undertaking [tramway or tramways in respect of which the penalty has been incurred or any part thereof] has been abandoned, be paid or transferred to such receiver or to the liquidator or liquidators of the company, or to be applied in the discretion of the court as part of the assets of the company for the benefit of the creditors thereof, and subject to such application, shall be repaid or retransferred to the company.

Fares, Rates and Charges.

32. The *company* may demand and take for every passenger traveling upon the tramway or any part or parts thereof, including every expense incidental to such conveyance, a fare not exceeding 1 penny per mile; and in computing the said fare the fraction of a mile shall be deemed a mile, but in no case shall the *company* be bound to charge a less sum than *one penny*.

33. Every passenger travelling upon the tramway may take with him his personal luggage not exceeding 28 pounds in weight, without any charge being made for the carriage thereof, all such luggage to be carried by hand and not to occupy any part of a seat, nor to be of a form or description to annoy or inconvenience other passengers.

34. The *company* shall not be bound, unless they think fit, to carry passengers' luggage exceeding .... pounds in weight, nor any parcel or goods.[1]

35. Goods, animals, articles or things (other than passengers and passengers' luggage and parcels not exceeding 56 pounds in weight) shall not be conveyed on the tramway between the hours of 8 in the morning and 8 in the evening, without the consent of the local authority and the road authority.

If the company is not to be authorized to take rates and charges for animals and goods, the following clause is to be inserted:

36. The *company* shall not carry on the tramway any goods, animals or other things other than passengers and passengers' luggage not exceeding the weight in this act in that behalf mentioned, and small parcels.

37. The *company* shall not take or demand on Sunday, or any public holiday, any higher fares or charges than those levied by them on ordinary week days.

38. (1) The *company* at all times after the opening of the tramways for public traffic shall, and they are hereby required to run a proper and sufficient service of carriages for artisans, mechanics and daily laborers each way every morning and every evening (Sundays, Christmas Day and Good Friday always excepted), at such hours not being later than 8 in the morning or earlier than 5 in the evening, respectively, as may be most convenient for such workmen going to and returning from their work, at fares not exceeding ½ penny for every *mile* or fraction of that distance. On Saturdays the *company* in lieu of running such carriages after 5 o'clock in the evening, shall run the same at such hours between *noon* and 2 *o'clock* in the afternoon, as may be most convenient for the said purposes.

(2) If complaint is made to the Board of Trade that such proper and sufficient service is not provided, the board, after considering the circumstances of the locality, may, by order, direct the *company* to provide such service as may appear to the board to be reasonable.

(3) The *company* shall be liable to a penalty not exceeding £5 for every day during which they fail to comply with any order under this section.

39. If at any time after 3 years from the opening for public traffic of the tramways or any portion thereof or after 3 years from the date of any order made in pursuance of this section, in respect of the tramways or any portion thereof, it is represented in writing to the Board of Trade by the local authority of any district in which the tramways or such portion, are, or is wholly or partly situate or by 20 inhabitant ratepayers of that district or by the *company*, that under the circumstances then existing, all or any of the fares or other charges demanded and taken in respect of the traffic on the tramways or on such portion should be revised, the Board of Trade may (if they think fit) direct an inquiry by a referee to be appointed by the said Board in accordance with the provisions of the Tramways act, 1870; and if the referee reports that it has been proved, to his satisfaction, that all or any of the fares or charges should be revised, the said Board may subject to the maximum fares and charges authorized by this act, by order in writing, alter, modify, reduce or increase all or any of the fares or charges to be taken in respect of the tramways or any portion thereof; and thenceforth such order shall be observed until the same is revoked or modified by an order of the Board of Trade, made in pursuance of this section: *Provided that a copy of this section shall be annexed to every table or list of fares published or exhibited by the company.*

Lands.

40. Subject to the provisions of this act, the company may enter upon, take hold and use for the purposes of their undertaking, the following lands shown on the deposited plans and described in the deposited book of reference (that is to say), etc.

41. The powers of the company for the compulsory purchase of lands for the purposes of this act shall cease, after the expiration of 3 years from the passing of this act.

42. If there be any omission, misstatement or wrong description of any lands or of the owners, lessees or occupiers of any lands shown on the deposited plans, or specified in the deposited book of reference, the company, after giving 10 days' notice to the owners, lessees and occupiers of the land in question, may apply to 2 justices acting for the county of ..... for the correction thereof; and if it appear to the justices that the omission, misstatement or wrong description arose from mistake, they shall certify the same accordingly, and they shall, in their certificate, state the particulars of the omission; and in what respect any such matter is misstated or wrongly described, and such certificate shall be deposited with the clerk of the peace for the county of ..... and a duplicate thereof shall also be deposited with the clerks of the *parish councils* [*or as the case may be*] in which the lands affected thereby are situate, and such certificate and duplicate, respectively, shall be kept by such clerk of the peace and clerks of parish councils, respectively, with the other documents to which the same relate; and thereupon the deposited plan and book of reference shall be deemed to be corrected according to such certificate, and it shall be lawful for the *company* to take the lands and execute the works in accordance with such certificate.

43. In addition to the other lands, which the company are by this act authorized to purchase and acquire, they may purchase, take on lease or acquire by agreement and may hold for the purposes of their undertaking any lands not exceeding 10 acres, and they may on such lands erect or construct and hold depots, yards, wharves, offices, buildings, sidings, works and other conveniences in connection with their undertaking; but nothing in this act shall exonerate the company from any indictment, action or other proceeding for nuisance in the event of any nuisance being caused or permitted by them on any such lands.

Capital, etc.

[Here insert clauses for capital, etc.: see p. 2 *et seq.*; but the following clauses are necessary in tramway bills.]

1. Where animals and goods are intended to be carried a clause should be inserted fixing the maximum rates for such carriage (see, for instance, Nottinghamshire, etc., act 1903, c. 164, s. 38).

44. The company shall not create debenture stock.

45. Every mortgage of the company's undertaking shall be deemed to comprise all purchase money, which may be paid to the company, in the event of a compulsory sale to the local authority under section 43 of the tramways act, 1870, and may comprise all or any moneys carried to the contingency fund, according to the terms of the mortgage; and every mortgage deed shall be indorsed with notice that the mortgage will not be a charge upon the tramways or the tramway undertaking in the event of such sale.

Miscellaneous.

46. The provisions of the tramways act, 1870, relating to the making of by-laws by the local authority with respect to the rate of speed to be observed in travelling on the tramways, shall not authorize the local authority to make any by-laws sanctioning a higher rate of speed than that authorized by this act, *or by the Board of Trade regulations*, but the by-laws of the local authority may restrict the rate of speed to a lower rate than that so authorized.

47. If any person wilfully does, or causes to be done, with respect to any apparatus used for, or in connection with, the working of any tramway of the *company* anything which is calculated to obstruct or interfere with the working of such tramway, or to cause injury to any person, he shall (without prejudice to any proceedings by way of indictment or otherwise, to which he may be subject) be guilty of an offence punishable on summary conviction, and every person convicted of such offence, or of any offence under section 50 of the Tramways Act, 1870, with respect to any tramway of the *company* shall be liable to a penalty not exceeding £20.

48. Where the consent or approval of any local or road authority is by this act required before the exercise of any powers by the company, such consent or approval shall not be unreasonably withheld, and if any difference arises as to whether any consent or approval is unreasonably withheld, that difference shall be referred to arbitration.

49.[1] Where under this act any question or dispute is to be referred to arbitration, then, unless other provision is made, the reference shall be to an arbitrator appointed by the Board of Trade and the provisions of the arbitration act, 1889, shall apply thereto.

50. All orders, regulations and by-laws made by the Board of Trade under the authority of this act, shall be signed by a Secretary or an Assistant Secretary of the Board.

51. Any penalty under this act or under any by-laws or regulations made under this act may be recovered in manner provided by the Summary Jurisdiction acts.

[In the case of companies' bills, here insert clauses "Interest on calls not to be paid out of capital" and "Deposits for future bills not to be paid out of capital," see pp. 20, 21.]

52. Nothing in this act contained shall exempt the *company* or the tramway from the provisions of any general act relating to tramways, passed before, or after the commencement of this act, or from any future revision or alteration under the authority of Parliament of the maximum fares, rates or charges authorized by this act.

SECTION IV.—ELECTROLYSIS IN GERMANY.

The Deutscher Verein von Gas und Wasserfachmännern have most kindly authorized your Committee to translate and utilize the admirable Reports of the German Electrolysis Commission. This favor not only relieves your Committee of the burden of any direct investigation of German conditions, but, moreover, provides a far more comprehensive and authoritative statement of the German status of the electrolysis problem than could otherwise be obtained.

The following translations have been condensed, where possible, in order to encourage the study of this section; and especial attention is directed to the "Regulations," which are given in full on pp. 137 to 143.

Report of the Electrolysis Commission of the German Society of Gas and Water Engineers in 1904. [*Condensed translation.*]

The Electrolysis Commission has continued its work in accordance with the following programme, outlined at the forty-third annual meeting at Zurich.

First: By issuing a set of questions, to collect a record of the conditions prevailing, and of the electrolytic experiences of gas and water works, in various municipalities.

Secondly: By means of special investigations, to obtain the actual facts in regard to the relation between the earth currents and the destruction of pipes, as well as definite information regarding protective measures.

[1] See also general arbitration clause at p. 99.

The set of questions was issued to 152 managements, by means of a circular letter sent out by the General Secretary of the Society, Geh. Hofrat Prof. Dr. Bunte. These questions are given on page 135.

One hundred and thirty replies were received, relating to 113 towns. [These replies have been tabulated by Prof. Dr. Teichmüller, and may be seen, together with his report thereon, in the 1904 proceedings of the Deutscher Verein von Gas und Wasserfachmännern.]

Of these 113 towns 4 had at the time no electric tramway service, and the following discussion is therefore confined to 109 towns having electric roads. As a result of the answers to question 2, these towns are arranged according to the kind of return circuits employed, as follows:

(*a*) Sixty-one towns, or 56 per cent., have rail return circuits without return cables.

(*b*) Forty-one towns, or 37.5 per cent., have rail return circuits with insulated return cables.

(*c*) Seven towns, or 6.5 per cent., have rail return circuits with uninsulated return cables.

In many of these installations the return cable is simply a connection between the negative bus-bar and the point in the rail network nearest the central station, so that the return circuit is formed essentially by the rails themselves. This restriction of the return circuit to the rails is usually found only in the electric roads of small towns. In the electric roads of the larger towns, the rails, in nearly every case, are fitted with auxiliary cables for the return circuit.

As far as can be ascertained from the replies, the size of the return wires ranges from one-half to the full section of the outgoing cable.

Only 14 of the towns, or 13 per cent., out of a total of 109, replied in the affirmative to question 5; that is, that electrolytic destruction has been found in the gas and water pipes. The others replied in the negative. Of these 14 towns there were: In 2 cases no return wires; in 1 case uninsulated return wires; in 1 case uninsulated and insulated return wires; in 10 cases insulated return wires.

In three of these towns (Hannover, Koenigsberg in Pr., and Strasburg in Els.), either the gas works or the water works reported corrosion, while the other reported that there was no corrosion. It must further be noted that in a number of towns which replied in the negative to this question, corrosion was actually found on digging up the pipes. In consequence of this, and in view of the experience gathered and of the replies concerning the conditions of the return lines, it must be assumed that in the case of a large number of towns replying in the negative, corrosion was actually occurring, but was not so far advanced that damage to the pipes, producing leakage or escape of water or the like, had been noticed.

The replies to question 2 show how imperfect are the return line arrangements in many cases, even occasionally in the larger cities.

In answer to question 7, a number of places report that the corrosion occurs in the neighborhood of the power station and close to the return connection points. [For further particulars see the original table and report of Prof. Teichmüller.]

The Commission has engaged Mr. Max Spindler to carry out the second task imposed upon it, viz., the special measurements.

The town of Elberfeld, where the gas and water works and a large portion of the electric trams are municipal, appeared to offer a field particularly well suited for these measurements. Moreover, Elberfeld offers the great advantage of possessing an extensive system of test wires, in connection with its electric light cables, by means of which the potentials of the rails, with reference to the negative busbar and with reference to a point in the soil favorably connected to the surface water near the central station, could be ascertained with accuracy. Mr. Spindler has recorded the results of these tests in a detailed report with sketches attached, and attention is directed to this original report. Following is a brief statement of the nature of these tests:

After making a number of preliminary trials, this order for the final measurements was decided upon. First, the potential of the rail network was determined relative to the negative busbar and relative to the soil near the central station; second, the difference of potential between the network of rails and the network of pipes was ascertained by individual measurements spread over the entire district.

As a result of this general investigation, characteristic points were selected where the strength of the current flowing through the pipes was determined by a special method of testing. As a further preliminary, a number of measurements were made to determine the resistance of pipes of different cross-sections, with and without spigot and socket connections, before as well as after caulking, and also after filling in and stamping down the earth in the trench.

These demonstrated that the resistance of a system of piping depends

to such a large extent on the condition of the joints and on the amount of metallic contact in the sockets, that not even approximately correct figures can be assumed, but that the resistance of each length of pipe under consideration must be measured separately.

A second series of preliminary tests was made at hydrants, house services, etc. In these it was found that only the hydrants made suitable connections, and those only for voltage measurements; for current measurements it was found essential to make direct connection with the pipe in question. The results of the measurements can be combined under the following headings: (A) Methods of measuring; (B) Danger and corrosion; (C) Protective measures.

(A) Methods of Measuring.

First of all, the electrical relations of the network of rails to the network of pipes should be determined and recorded in the most complete manner. For this purpose the difference of potential between the rails and the negative busbar during the period of full load on the tram lines must be determined at a large number of places and at all characteristic points (points where the return lines are connected, points likely to have the highest rail potential, etc.), and a graphic representation of the distribution of the potential in the rail network must then be made.

Special test wires should be used for this purpose, although if necessary telephone wires can be used temporarily. The measurements of voltage between the network of rails and the ground possess less value, because the potentials of the ground points vary in the same way (although in less degree) as the potentials of the rails. Where possible it is also desirable to determine at numerous points the potentials of the pipes with reference to the negative busbar. The difference of potential between the rails and the pipes must also be determined at as many points as possible, especially at all characteristic points. In this case it is advisable to make the measurements at the water pipes, for which purpose the hydrants should be used for making contact.

The graphical representation of the results obtained by these measurements furnishes a clear idea of the course of the potential in the rail network on the one hand, and in the rails with reference to the pipes on the other hand; and shows whether the installation for returning the currents is properly designed and operated. It also shows where the particularly endangered zones of the pipes are located, what defects in the arrangement of the return lines cause this danger, and how the trouble can be prevented.

It can be seen from the chart in which districts the pipes have a higher potential than the rail system; that is, in which district current passes from the pipes to the earth or to the rails. Likewise points can be indicated where the potential of the pipes is negative to the rails; also, where there is an escape of current from one main into another or into ground of especially good conductivity.

In connection with this graphical representation, the voltage can also be determined between a number of hydrants in districts where the rails are negative to the pipes or where uuusual phenomena make such measurements desirable. The hydrants used for these determinations must be so selected that the stretches of pipes between them are continuous without other pipes branching off. The difference of potential should be first determined when the railway service is suspended, and then again when the railway is in full operation.

These measurements furnish a reliable basis for obtaining the direction of the currents in the pipes, and, taken together, make it possible to locate approximately the points of escape of current. In consequence of the results of these general measurements, the actual measurements of the currents in the pipes can be limited to a few places. The most suitable practical method for this purpose was to expose the pipe at 3 selected points which were from 65 feet to 100 feet apart, and while the service was suspended to determine the resistance of the 2 included lengths. When the railway was in operation the currents in the pipes could then be determined with sufficient accuracy by measurements of potential differences. (To be Continued.)

Introduction of the Gas Arc Lamp.

[A paper read by Mr. Glenn R. Chamberlain, at the last meeting of the National Commercial Gas Association.]

If one were to write a brief history of gas lighting, it would undoubtedly take a form similar to this:

1. First practical application or use of the discovery of coal gas, by Robert Murdoch, in lighting his own home at Redruth, Cornwall, in 1792.
2. Lighting by gas of the Lyceum Theater, London, England, 1803.
3. First public street lighting by gas, Pall Mall, London, 1807.
4. Discovery of the Bunsen flame at Heidelberg in the early '50's.
5. Discovery of the incandescent mantle by Auer von Velsbach, Heidelberg, 1885.
6. Invention of the gas arc lamp.
7. Practical application of the "inverted" type of incandescent gas lamp, having single or cluster burners, present day.

The two chief essentials of the incandescent system of gas lighting are the Bunsen flame and the mantle, and it may not be out of place to say here a word or two regarding each of these simple but very important discoveries.

It has been said that the Bunsen flame has done more for the prosperity of gas lighting, and the progress of the gas business as a whole, than any other thing. This discovery was made in the early '50's by an assistant to Bunsen, Sir Henry Roscoe, who pointed out to his chief that a non-luminous flame could be produced by passing coal gas a short distance through air and then taking it through a piece of wire gauze. The invention became known to the world as the "Bunsen" flame, and we, of course, owe to it not only incandescent gas lighting but all of the designs of non-luminous gas fires so commonly used in our domestic and industrial fuel appliances.

By some strange coincidence, the birthplace of the Bunsen burner was that also of the accidental discovery of the mantle, about 40 years later. The story, though old and worn, is always interesting, of how Dr. Welsbach, while pursuing his studies in the rare metals and earths, accidentally allowed a solution containing salts of the rare metals to boil over and evaporate on the fibers at the ragged edge of an asbestos card which was used to support the beaker. The flame was playing around the card and he noticed that the salts became luminous. We are told that he devised a sort of mantle to fit over the Bunsen burner, and it was only after infinite work and patience that his discovery became an assured commercial success.

A close study of the history of the gas industry will reveal that Providence seems, from the first, to have kept a watchful eye over it, and it was indeed a kind Providence, given a generous boos by invention, that saved, to a greater or less extent, the gas lighting business when our one great competitor entered the field. Likewise a kind Providence stepped in at an opportune time and furnished a man capable of successfully clustering these burners into what is called the gas arc lamp. This in its turn has taken up the work of commercial lighting at a point beyond which it was not possible for the single burner lamp to go, and the success of this artistically designed, powerful and efficient unit is in evidence everywhere. Many seem to feel that we now are surely at the end of our resources and that improvements in our illuminating appliances are not further possible, to the extent at least of holding for us permanently the high place we now occupy in the field of artificial lighting. We are constantly hearing of new inventions along electrical lines—in lamps of greater efficiency, designed to reduce the hourly consumption of current per unit and to cheapen costs to the consumer. Happily, however, invention is not the monopoly of any particular industry, and it is at work also for us, producing results which make us very optimistic as to the future. For example, we have every reason to believe that the entire success of the inverted gas arc, as well as the single burner lamp, is assured.

To the gas man looking for detailed information regarding the gas arc, and for arguments and methods for pushing its sale, much that is helpful and practicable may be readily found in the booklets and other advertising literature furnished gratis by the manufacturers of these lamps. The city which the writer represents is credited with having in use, considering its size, a large number of gas arc lamps, both of the inside and outside pattern, and it would be difficult to trace the cause to any other than a well trained force of representatives or solicitors who are constantly hammering, hammering, hammering on their commercial lighting prospects. Coupled with this, of course, is required sufficient pressure to well fill the mantles of the lamp, and a well organized maintenance department, whose instructions are to give the service that will keep every lamp in the business district shining like a new, gold dollar. These conditions, backed up by a desire on the part of the company to give the gas consuming public the "best there is in the basket," ought to win for any company a large share of the commercial lighting without being obliged to give away either the lamps or the gas. This is business that will not force itself upon a company to any noticeable degree, but must be gone after, and vigorously.

Good maintenance service cannot be over-estimated, and, in fact, a representative should be given but little credit, indeed, for the sale of a gas arc, whether displacing electricity or not, unless the order is accompanied by an agreement for maintenance service. Arc lamp users will not properly maintain their own lamps, and maintenance service furnished at cost, or even at a slight loss, if well done, is vastly more re-

munerative to a gas company than other advertising methods, which at best in this line are more or less of a haphazard nature. For the year 1906, just closed, there were maintained without loss to the department about 5,000 gas arc lamps per month. The uniform price charged was 20 cents per lamp per month, and the service included all cleaning, renewals of mantles, glassware, etc., making 4 calls on each lamp per month, and, figuring all expenses incident to this work, such as blank forms, records, clerical salaries, etc.

Many gas companies seem to have educated themselves to the belief that because their competitor makes free installations of the electric arc they must do it also in order to get and hold business. In the light of the experience of many other companies, operating under conditions otherwise similar, this would not seem necessary—at least not necessary if never begun. It must be borne in mind that there are but very few instances where the electric company can deliver as much light, say for 2 cents, as the gas arc will furnish, and the consumer can, therefore, well afford to pay a fair price for the lamp and still save a good round sum by so doing. Does it not seem inconsistent to equip one store with chandeliers and single burner lamps at a fair profit on the sale, and equip the store next door with gas arcs free, or at less than cost? It would seem that disadvantages accrue to the company which follows the practice of making free installations of gas arcs, or, in fact, any other gas consuming appliances, among which may be mentioned:

1. An enormous investment in appliances which rapidly deteriorate in value, principally because of improvements constantly being made in the construction of such appliances.

The superintendent of a very large gas company recently remarked that his company did not attempt to keep up with the times in this particular—was, in fact, still buying an earlier design of lamp, and dared not show or light up his office with the latest pattern, because as soon as his old consumers saw them there would be a clamor for a change, and his company could neither afford to comply with such requests nor to offend the good old consumer by refusing.

2. When we give away appliances or sell them below cost, it would seem to be an admission that, although we may be successful gas men, we are not successful merchants, and it must also naturally appear to the public that the gas sold through these appliances must net the company so great a profit that the gratuitous distribution of many thousand dollars' worth of appliances is to us a mere bagatelle—an erroneous impression for which we have only ourselves to blame.

3. An amount of money, not greatly more than liberal interest on such an "investment," could be expended on good solicitors, who would sell at a profit practically as many lamps as are now installed free or at less than cost—*i. e.*, compared with the free installations that prove to be profitable gas consumers.

4. Because any proposition of a free nature attracts a large proportion of unprofitable business and, unless closely guarded, lamps will be installed that will show no consumption for months, simply because they are being used as a convenience—an "ever ready"—in case of a temporary suspension of the electric service.

It is of course not always easy to convince the consumer that we, as merchants, cannot afford to sell our appliances at a loss, and the experience of our Company with a certain clothing man might be of interest in this connection. This man is a type of merchant who might be called a "clever" buyer, were it not for the fact that it is sometimes necessary to buy more than once at the same place. He persuaded us to put in a half-dozen new lamps, with the understanding that if they proved economical in consumption and otherwise satisfactory, he would at the end of thirty days pay our net cash price. He stood us off for three months before coming to a satisfactory decision with himself, and then offered us half price, using the argument that inasmuch as the lamps were now second-hand, and if taken back by us could be sold only at a reduced price, he therefore should be given the first opportunity of buying them as second-hand arcs. This experience reminds one of the story of the old pawnbroker who was contemplating the purchase of a watch, which a friend had allowed him to keep over night to examine. His soliloquy on the subject ran as follows: "He wants $10 for it, but he will take $8; I think it is worth $6, so I'll offer him $4."

The problem of outside gas arc lighting is now receiving considerable attention, and abundant experience has already been had to prove that this method of lighting is not only economical and practicable for the merchant, but is a good source of revenue to the gas company and a most excellent advertising medium for both. Our Company started its campaign for outside gas arc lighting by encircling the triangular block in which our office is located with a band of 1¼ pipe from which arc lamps were suspended at certain intervals. Two risers, with meters connected, supply gas to these, the meters being there for a check on the actual consumption. These lamps for two years have been successfully lighting, not only the street and sidewalk, but in many cases the show windows as well, and are paid for by the merchants in the block on a flat rate per lamp basis, the lighting hours being from dusk to 11 o'clock, the lighting and extinguishing, of course, being done by the Company's men. This was quite extensively advertised as the "Triangle of Light," and much outside lighting business has since come in readily. The plan has, therefore, been seriously considered of going to block-after-block of this flat rate outside lighting on those main business streets, where a continuous band of lights can be assured.

Undoubtedly many gas companies have been hindered more or less in their efforts to secure business by unfair statements made by, or in the interests of, competitors regarding certain alleged bad effects produced by the burning of gas in an inclosed room, and the following article, quoted from a competent English authority, may, in extreme cases where a defense is needed, prove of some value: "Many people, though recognizing the greater cheapness of gas, tell us that they prefer the electric light because they consider it cleaner and more healthful. One frequently hears it said that the sulphur products and carbonic acid from gas are liable to damage the pictures, bindings of books, etc. On such a point Prof. Percy F. Frankland, of the Birmingham University, will probably be accepted as a competent witness. In the year 1902 that distinguished scientist was requested to report on the lighting of the large room of the Birmingham Art Gallery, and, as a result of close observation and carefully conducted experiments, he found that with adequate ventilation—and, of course, ventilation is necessary whatever method of lighting is employed—the room was freer from carbonic acid when incandescent gas lamps were used than when electricity was the illuminant. This, indeed, is understating the matter, for what he found was that, when electric arc lamps were employed, there was a marked increase in the carbonic acid in the room, while, on the other hand, when gas was being burned, instead of there being any increase there was a distinct diminution in the percentage of carbonic acid. The reason for this is that the live flame of the gas, by keeping the air in motion, promotes ventilation, and thus helps to keep the atmosphere pure.

"Still more striking is a paper read by Dr. S. Rideal before the Sanitary Institute, Glasgow, July, 1904, in which it was stated that, as a result of experiments made in London by himself and Dr. Otto Hehner, it had been found—and had been so reported to the Board of Trade—that there was more sulphuric acid, proportionately, in the outer air than in the air of a closed room in which gas had been burning for some time. Let it be noted too that the room in which the tests were made was one in which all the usual openings were closed, and there were no means of ventilation except through the walls. The important factor, Dr. Rideal explained, was the absorbent action of the ceiling and walls of the room, the sulphur acid being at once fixed by the lime.

"An important question is, of course, that of the effect of different lights on the eyesight. There is a consensus of opinion that the ultra-violet rays in the electric light are injurious to the eyes; and I notice, in a paper read before the Public Health Congress, July, 1905, the opinion is expressed that the worst form of artificial lighting for schools is the electric light, unless the 'red rays' are killed. On that point the well-known medical journal the *Lancet*, said not long ago: 'For some not very clear reason, the light of the incandescent electric lamp seems to be wearing, or taxing the muscles of accommodation of the eye, and a great many people complain that reading by the electric lamp gives rise to headache. Possibly the fact that the light is rich in red rays, especially when the lamp is not burning with full efficiency, may have something to do with it, or perhaps the distribution of the light from a loop instead of a fixed center may have some disturbing effect on the eye.'

"In view of such testimony, one cannot wonder that gas is finding increasing favor for school lighting, and that at Brierley Hall, in South Staffordshire, for example, it was decided quite recently to remove an electric installation and substitute gas for the lighting of the Free Library and Technical School."

While we, as gas men and gas appliance manufacturers, have every reason to congratulate ourselves on the excellent showing we have made and are making, it behooves us to "keep our fingers crossed," as it were, and also keep in mind the saying that "It is in general more profitable to reckon up and correct our defects, than to boast of our attainments."

In closing, it is to be understood that it was not the writer's intention, for more reasons than one, to write a learned discussion on the subject of the gas arc lamp, and he fully realizes that the matter submitted is only the mere commonplace met with in the everyday life of the average gas man, the only hope being that a point or two may have been raised that will lead to a free and full discussion of an important subject.

[Communicated by "R."]

Gas Pipe Trussing.

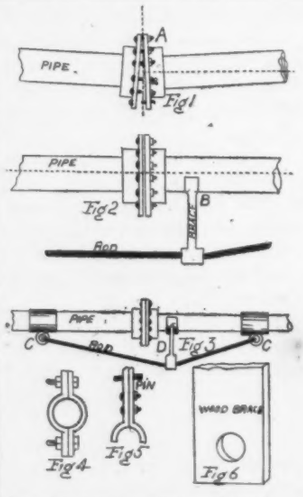
Fig. 1 is a sketching of the familiar appearance of the poorly trussed gas pipe main, and the fraternity would be astonished if it were aware of the flagrancy of cases of this kind. The writer has observed cases of this character in which poorly planned supports for long pieces of pipe have allowed the pipe to settle and break open the lead joints at the flanges. Sometimes the poorly trussed pipe will sag a long distance without fracturing itself at any point, for much depends upon the nature of the couplings. Stiff unions are quite liable to become broken under the unusual irregular strain. If the joints are effected with series of threaded unions, the opportunity for the pipe to assume a drooping bow-like position with breaking is greater, but as a rule the installation of gas piping is of such character that there is not very much margin offered for drooping. Hence it is the aim to get the pipes properly supported. You can trace cases of leaking to ill-braced pipes. Considerable annoyance always arises from the pipe which is allowed to settle. Of course, there may be a long span to make, and conditions may be such that trussing cannot be done. I have seen pipes carried from house-top to house-top, and also observed them installed in manufacturing plants where they ran considerable distances over poorly arranged supports. Then there are pipes which are used to convey gas from one apartment to another, sometimes making great jumps from one strut to another. Much carelessness can be observed in the planning of these combinations, and it is for the purpose of suggesting some remedies for these difficulties that the accompanying sketches are given.

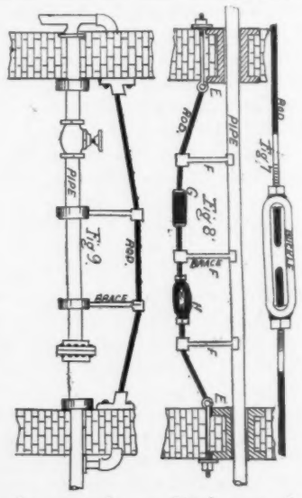
In one shop I noticed that a pipe was practically in the condition exhibited in Fig. 1. The center between the two supporting points of the main was so far from either side that the weight of the pipe depressed the same to the extent of developing the break in the bolts of the flanges, as at *A*. Therefore, a half-inch iron rod truss was secured and put up as illustrated in Fig. 2. The ends of the rod were attached to bolts fastened to posts on either side, which posts were a part of the wall work of the structure. The truss was put up on the same plan as trusses are employed in bridge work. A metal brace was then constructed and inserted with the lower end on the truss and the upper end below the pipe, as at *B*, thereby affording a means for bracing the pipe line. The pipe was very readily "buckled" up as soon as the connections were made. The flanges were then secured with new bolts, the proper red lead was cemented in and the bolts tightened up. In the event that the walls of the building do not afford the chance for bracing a pipe with a rod, the plan in Fig. 3 can be used. In this case two metal outer sleeves are made, and these are braced on the pipe at proper distances from the flanges, at the points *C, C*. Or if it is desired to have the sleeves adjustable, they can be secured on the pipe by means of clamping bolts. The sleeves can be made in halves and clamped on. Then the rod is hooked into the eyes of the sleeves and is utilized to truss up the pipe by putting in the brace *D*. This makes the necessary support for the middle of the pipe.

A good form of clamp for a line of pipe is exhibited in Fig. 4. These clamps can be made of cast iron, if trouble is taken to construct the mould, but as a rule only a limited number of sleeves are wanted at one time and, therefore, the blacksmith can be called upon to forge out the set of clamps from wrought iron. Then the necessary bolt holes are drilled and the sides are ready for securing to the line. A form of brace with pin is shown in Fig. 5. It is made of two sides, each side being forged to fit together, so that when mated and riveted the lower end is shaped in a curve to fit over the pipe surface. The upper end can be similarly shaped to fit the rod, depending upon whether the pipe is braced from below or supported from above. Wood braces are by no means inferior devices for this line of work, only that it is necessary to open the line of pipe in order to get the pipe through the bore in the brace, one of which is exhibited in Fig. 6. Sometimes a passage for the pipe is cut through the side of the wood brace to the hole. I have seen a number of these supports used in rotation, doing away entirely with the trusses. It is a good plan to use a buckle in connection with the rod truss. Almost always it becomes necessary to adjust the level of the pipe by slacking up or taking up on the rod, for it is seldom that the rod can be worked out exactly the proper length, hence the buckle shown on the rods in Fig. 7 is recommended. It is forged out of wrought iron, like the supports. There are manufactured trusses with all the necessary attachments affixed, and these rods are usually equipped with cast iron buckles.

While the buckle alone is calculated to be capable of drawing up and holding the butts of the rods, it is best to favor the threads on the rods and in the buckle as much as is possible, by using lock nuts; hence the cut shows a set of lock nuts in service. These lock nuts can be turned up hard against the buckle, after the adjustment of the tension of the rod is completed, and they will prevent the buckle turning because of vibrations of the building, and likewise assist in relieving the strain on the threads.

In Fig. 8 is shown the manner in full of securing support for a pipe making quite a long span. It is quite necessary that the pipe be securely held in line to avoid opening the lead joints. If the line of pipe extends from one wall to the other, as in this instance, a good supporting truss may be obtained by linking up a rod with bolts put through the brickwork. You will need to drill through the masonry with a long cold chisel. The nut for holding the bolt can be outside as shown. Then the ends of the truss rod are hooked into the eye of the bolts, as at *E, E*. The braces are arranged as at *F, F, F*. Two kinds of buckles are shown. One is the link, as at *H*, and the other is the cylindrical form, as at *G*. The link buckle can be turned readily by inserting a bar through the opening. The cylindrical style of buckle should be furnished with shoulders at the ends, so that a large-sized





wrench can be used. The jaws of the wrench are fitted over the shoulder and the buckle can be turned very easily.

Then there is the top form of supporting truss as shown in Fig. 9.

Occasion often arises in which the under system of trussing cannot be used. Perhaps there is not room enough below for the mechanical structure of the system. Therefore the space above is used, as shown. Instead of bolts being put through the walls, as in the former case, sockets of cast iron are employed, because we have in this case a thrusting strain on the rod instead of a drawing strain. Hence the greater the exertion put on the rod the harder the sockets are pushed into place. However, they should be cemented securely to the walls and if possible properly mortised in. The braces are adjusted. These have to be made with collar ends and the collars are slipped over the ends of the rod and the pipe. A combination of the kind shown will support a heavy pipe.

The Coal Industry in Indiana.

A correspondent in the *Engineering and Mining Journal* says that, considering the fact that the past year has been filled with trouble, and that the coal industry got a bad start, the production has been equal to expectation, falling a little below that of the previous year. Anticipating a strike April 1, the operators worked their mines to full capacity during February and March, and then there was a general cessation until June 10. Following this there were local strikes, scarcity of water and lack of cars, which occasioned from 2 to 3 days' idleness each week. The price of coal has been fairly satisfactory, but this availed little while the operators were unable to get the coal into the market. The principal contentions during the year were over

minor matters, such as removing slate, shot firing and transportation to and from the mines.

The year will pass into history as the first instance when the joint convention of miners and operators failed to agree upon a wage scale, and the subsequent failure upon the part of the operators to stand together for the old scale. However, the result of these peculiar events had little to do with the volume of production, the most serious handicap to a large tonnage was due to car shortage.

The prospects for next year are very good, and if present prices prevail throughout the year there need be little fear but that the coal industry in this State will yield a good profit. The operators take great hope that the legislature will pass measures calculated to afford the desired relief from unjust car demurrage and more prompt shipment of consignments.

The mine workers are asking for a law to prevent the employment of incompetent men as miners. A bill has been prepared which provides for examinations of all who seek employment, and in many respects modeled after the Pennsylvania law. The bill provides for a commission of 3 miners, to be appointed by the Circuit Judge, whose salaries are to be paid by a fee of $1 from each applicant for a license. The applicant will be required to have had 2 years' experience as a mine laborer. It is understood that the operators will not oppose the bill, since the matter is largely within the province of the mine workers, and if they assume the responsibility to provide competent licensed men, the mine owners may escape the responsibility of their negligent acts.

The miners are still refusing to return to work in the Rosebud mine, where the serious explosion occurred. The conditions that the company insists upon, and to which the miners object, is that shotfirers shall examine all shots before they are set off, and if an illegal shot is found, the shotfirer shall make a report of it, including the name of the miner who put in the shot. The company also insists that when the miners return to work they shall fire their own shots on the first day. The miners profess to see in these restrictions the hand of the liability company which carries insurance in the mine, and recognize in it an effort to get evidence for the defense in the damage suits which will be brought by the victims of the Rosebud explosion against the Vandalia Coal Company and the liability company. The 30 injured miners have retained legal counsel in order to sue for damages.

There is a bitter contention between the miners on the one hand and the mine inspector and the company on the other hand as to whether it was a dust or a smoke explosion. The miners are greatly displeased with Inspector Epperson for deciding that it was a smoke explosion and will, they say, endeavor to prevent his reappointment.

There is considerable interest manifested in the proposed investigation of the coal producing industry of Indiana by the Interstate Commerce Commission in February next. The commission proposes to direct its attention to the coal mines of the State with a view of ascertaining just how closely identified some of the mining companies are with railroads of the State. A point to be determined is whether stock in any of the Indiana coal mines is owned by railroad companies, and to what extent that ownership cripples the marketing facilities of competing mines.

The Indiana Railroad Commission has suspected for some time that the management of the Southern Indiana Railroad is heavily interested in coal mines in southern Indiana, and this fact accounts for the alleged discrimination in favor of these mines in the supply of cars to move the coal.

Careful and scientific tests are being made at the Indiana Penitentiary, at Jeffersonville, with a view of deciding, if possible, the relative standard of merit, as far as the uses of that and similar State institutions are concerned, between Pittsburgh river and Indiana coal. The two coals are now being used in competition—the former at $1.97 and the latter at $1.45 a ton.

It is asserted by the advocates of the Pittsburgh coal that the difference in price is more than counterbalanced by the superiority of the coal. The Indiana coal men dispute this, and a thorough test of the question is being made, with a careful record of results obtained with each class of coal. The State hopes to base future contracts for coal on the basis of the relative values ascertained by the tests.

MR. W. T. OVIATT has been appointed General Manager of the gas and water divisions of the properties of the Consolidated Railway and Light Company, of Connecticut, with headquarters in Bridgeport. He succeeds Mr. John E. Sewell, who has been appointed as Chief of Staff to Vice-President Calvert L. Townley.

The Year 1906 in Oil.

The *Petroleum Gazette* notes there are undoubtedly many oil men who, if asked to name the most notable phase of the oil business in the United States during the year now closed, would say at first thought that it has been increased production; yet there has been no increase in the aggregate in the petroleum production of the country during the year. On the contrary, it will be shown, when the government's reports on the subject appear, that the production of petroleum of all kinds in the United States during the year 1906 was approximately 10,000,000 barrels less than in the year 1905. Furthermore it will be shown that, with all that has been said in the meantime of overtaxed piping and storing facilities in the Territories and in Illinois, the demands of consumption on the oil fields of the United States have called for from 8,000,000 to 10,000,000 barrels more of oil than the combined output of all these fields during the year, and the stocks have been drawn upon to that extent.

Our estimates of United States production and consumption of oil for the past year, designated in barrels, are in round numbers as follows:

Fields.	Production.	Consumption.
California	26,000,000	32,000,000
Pennsylvania	25,000,000	27,000,000
Ohio and Indiana (Lima oil)	24,000,000	28,000,000
Kansas, Ind. Territory and Oklahoma	22,000,000	13 000,000
Texas and Louisiana	21,000,000	29,000,000
Illinois	3,000,000	1,500,000
Kentucky and Tenneseee	1,200,000	1,000,000
Other States	1,000,000	1,000,000
Totals	123,200,000	132,500,000

For the purpose of comparison the government's report by States of production in 1905 is reproduced as follows, the designation being in barrels: California, 33,427,473; Texas, 28,136,189; Ohio, 16,346,660; Kansas, Indian Territory and Oklahoma, 12,013,495; West Virginia, 11,578,110; Indiana, 10,964,247; Pennsylvania, 10,437,195; Louisiana, 8,910,416; Kentucky and Tennessee, 1,217,337; New York, 1,117,582; Colorado, 376,238; Illinois, 181,084; Wyoming, 8,454; Missouri and Michigan, 3,100. This summary includes with Ohio's production 5,016,736 barrels produced in southeastern Ohio which was of the Pennsylvania grade, and which, added to the New York, Pennsylvania and West Virginia production, made the production of crude of the Pennsylvania classification 28,149,623 barrels for the year 1905.

The only fields in which the production has exceeded the consumption during the present year have been those of the Middle West and Illinois, but this increase, as above indicated, could have been 8,000,000 or 10,000,000 barrels larger than it has been during the year without more than offsetting the shortage in the meantime in the other fields. All other fields have been worked to their full capacity with the exception of California, but even in that State, where numerous wells are shut in, especially in Santa Barbara county, conditions have not been so readily adjustible that the consumption has not exceeded the production and resulted in a heavy drawing on the stocks above ground, which are now believed to be considerably below 10,000,000 barrels and confined chiefly to the very heavy oil of the Kern river field.

As compared with the production of Texas and Louisiana in 1905, which reached the large total of 37,046,605 barrels, the production of those States will be shown to have fallen from 12,000,000 to 15,000,000 barrels during the present year, and that in keeping up with the demands of consumption there has been a drawing on the stocks of those States amounting to 8,000,000 or 9,000,000 barrels during the year.

Though the production of the fields of the Pennsylvania classification continues to hold up well, the demands of consumption upon them have been so steadily in excess of the production that the stocks have been nearly wiped out.

At this time a year ago the total net stocks of Pennsylvania oil as reported by the Standard's pipe line branches, including Kentucky and Tennessee, amounted to but 2,806,317 barrels and the stocks of this oil held at the same time by other interests amounted to considerably less than 1,000,000 barrels.

When the pipe line was put into operation a couple of weeks since the amount of oil in storage in Illinois is said to have exceeded 1,000,000 barrels. If 2,000,000 barrels of oil have been shipped to the Standard's refinery at Whiting, Ind., during the year it has not needed to go into storage for the lack of demand, and it is assumed that it has been used chiefly as delivered, limiting the stocks of Illinois oil practically to what is in storage in the fields, amounting at this writing to about 1,500,000 barrels. It is a foregone conclusion that there will be a large increase in the amount of oil handled from Illinois and the Middle West

fields, but from the figures above given it will be observed that the increase can be a large one and continued for some time, other conditions remaining the same, without more than making up for the general shortage for the present year.

The Colors of Recent Illuminants.

The *Electrical World*, in editorial mention of this subject, says that with the advent of illuminants of very high efficiency it would be natural to suppose that the color question would take care of itself, always providing that the light is not colored like that of the mercury arc, or of the ordinary form of the flaming arc. When incandescent lamps reach the efficiency obtained by the Nernst glower, tantalum, osmium and tungsten filaments, one naturally expects that the color will be sufficiently near to white and compare favorably with any known artificial light. These modern lamps are, of course, a great improvement over the incandescent in point of color, but it seems doubtful whether even the best of them is white enough to permit the finest kind of color discrimination. There is, to be sure, no standard white and no terms in which to classify these or any other illuminants. Even sunlight varies from white, or bluish white, when the sun is high, to orange when it approaches the horizon. If one could see a pile of colored fabrics simultaneously in the light of the noon-day and the setting sun the contrast would be startling to the last degree. Still more extraordinary would be the result could one see a third pile of similar fabrics illuminated by the light of a north window, which is far bluer than any artificial illuminant, except possibly an inclosed arc of low amperage. As compared with sky light all incandescent lamps, even including the tungsten light, look yellow. In this general uncertainty it might seem a matter of comparatively little consequence whether a given illuminant varied slightly in the direction of yellow or of the blue, from what one might be pleased to call normal white.

Experience, however, shows that even these comparatively small variations can make themselves felt in a very striking way. For instance, in a certain factory producing colored articles covering a very wide range of slightly differing shades, experiments were recently tried in performing the necessary sorting of shades under several forms of artificial lights. The results of this test showed that incandescent lamps, even when as near white as the Nernst light, failed to give the necessary power of discriminating between closely allied shades, and the ordinary inclosed arc was, through error on the side of the blue, equally unsuccessful, and by far the better results were secured with an arc lamp with relatively large amperage. Even in the arc it seemed to be necessary to push the current density in the arc very high in order to obtain a light of first-class color. This may be done either by using very powerful arcs and large amperage, or by using a comparatively small carbon with moderate current. Some arc lamps are now on the market using carbons of as little as 5 mm. diameter, and with this it is, of course, practicable to obtain an arc of moderate power and good color. A larger carbon with larger current attains the same result. It will be interesting to observe whether an incandescent lamp, even of considerably higher efficiency than any now in use, will be able to give a color effect practically as good as that attained with arc lamps. Of course, the temperature of the crater in an arc worked at high current density is considerably higher than that of any incandescent filament yet produced. The practical question involved is whether the color quality necessary for the finest discrimination between tints can be obtained at the temperature of the one or the other. So far no experimental data sufficient for answering this question are at hand, and investigations to determine the facts of the case are certainly in order.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

An act incorporating the Lisbon Falls (N. H.) Gas and Electric Company is before the Legislature of that State. The incorporators are: Messrs. F. C. Whitehouse, Wm. H. Newell, W. E. Plummer and H. E. Plummer; it is capitalized in $50,000; its title is the Lisbon Falls Gas and Electric Company, and its object is to supply gas and electricity in the districts of Lisbon Falls and Durham and to the west side of Topsham.

At the annual meeting of the New Britain (Conn.) Gas Light Company the Directors elected were: A. J. Sloper, H. E. Russell, E. N. Stanley, John Walsh and F. M. Travis. President, A. J. Sloper; Secretary, H. T. Sloper; Treasurer, A. J. Sloper; Auditor, E. N. Stanley.

Mr. Hugh G. Neary has resigned the Superintendency of the Albany (N. Y.) municipal electric lighting plant.

Mr. John H. Pardee has resigned the position of General Manager of the Rochester (N. Y.) Eastern Rapid Railway Company to assume the duties of General Manager of the electric division of the railway properties operated by the J. G. White Company, of this city. He is in every good sense a competent man.

Mr. C. W. McCormack and associates have made a bid of $75,000 for the municipal gas works at Henderson, Ky. The prospective purchasers agree not to increase the selling rates and further pledge themselves to expend within a certain specified time the sum of $25,000 in improvements and extensions.

During the year 1906 the Tacoma (Wash.) Gas Light Company showed an increase in output over that for 1905 amounting to 15.6 per cent.

At the annual meeting of the shareholders in the Washington (D. C.) Gas Light Company the following Directors were elected: John R. McLean, George T. Dunlop, Milton E. Alles, R. H. Goldsborough and John McIlhenny.

Mr. Charles Dickerson, formerly in the service of the Grand Forks (Neb.) Gas and Electric Company, has been appointed Superintendent of the Grand Forks municipal lighting plant, vice Mr. Samuel Allard, resigned.

The plants of the Monterey (Cal.) Gas and Electric Company are to be rebuilt completely.

The gas main system of Davenport, Ia., is to be increased by the placing of 20 additional miles, and work on the extensions will be commenced as soon as possible.

The capital stock of the Mount Carmel (Ills.) Gas and Electric Company is to be increased from $15,000 to $25,000.

All the earmarks seem to indicate that Governor Guild proposes to reappoint ex-Mayor Weed, of Newton, Mass., to the Massachusetts Board of Gas and Electric Light Commissioners.

The business of the Cruse-Kemper Company, of Philadelphia, Pa., having increased to such an extent as to cause its former offices to be all too small for its needs the Company has removed to the Land Title Building, Suite 1,124, where President Cruse and his associates will be glad to welcome visiting gas men, whether the latter are in the market for holders or not.

In the suit of the American Tool Company against the Acme Gas Company, tried before Judge O'Doherty and a jury this month, in Louisville, Ky., a verdict for $17,200.07 (the full amount asked for) was given the plaintiff. Plaintiff alleged that defendant failed to install a gas producer plant that was satisfactory in any respect, or at all commensurate in results with the pledges made by its constructors to the purchasers. In fact, so inadequate were the results that the apparatus was "scrapped." Defendants pleaded failure to comply with the specifications, and stated that the producer was merely an experiment that failed and that the failure did not make it binding upon the performers that the machine should operate.

The persons in charge of the affairs of the San Francisco Coke and Gas Company have petitioned for the right to change the title to that of the Metropolitan Light and Power Company. The leading point in support of the contention is to "Prevent its business from becoming confused with that of the San Francisco Gas and Electric Company." To an observer at this focussing end of the viewpoint it would seem, judging from the plaint of the petition, that there exists no particular need for the amendation. There would really have been no confusion.

A correspondent in Indianapolis, Ind., forwards the following: "Under a current decision of the Supreme Court it is ruled that the Indiana Cities and Towns Act, of 1905, does not give cities any power to regulate the price of gas sold by Companies already operating under a franchise; the people of the cities and towns of Indiana must look to the Legislature now in session for any limitation on the price of gas. The decision of the Court was that in a case appealed from the Wayne Circuit Court, in which the city of Richmond sought an injunction against the Richmond Natural Gas Company to prevent it from raising the price of its gas. In affirming the judgment in favor of the Gas

Company, denying the injunction, Judge Montgomery held that the sufficiency of the complaint depends upon the validity of the ordinance under which the Company operates. 'For the purposes of this case,' said the Judge, 'we need not determine whether or not the granting of permission and the construction of the plant in pursuance thereof created a contract, but content ourselves with a reference to the law holding that where a franchise to supply gas is granted without restriction as to prices, accepted and acted upon, cities incorporated under the general law of this State had no authority prior to 1905 by subsequent ordinance or action to impose additional regulations limiting the price to be charged for gas, charged under the original franchise.' After quoting Section 36 of the law of 1905, and further reviewing the case, Judge Montgomery says further: 'It appears that the attempted regulation was not done by contract nor in connection with the granting or acceptance of a franchise, and the Legislature has not delegated the city any authority, whatever authority it may possess to regulate prices of gas in any other manner. It follows that the ordinance relied on is invalid as against appellee, and that the demurrer was rightly sustained.'"

WILL wonders ever cease? Here are the main determinations from the report of the special committee appointed by the Central Labor Union, of Washington, D. C., to consider whether or not the Union should agree to indorse the provisions of the Madden bill under which it is proposed to put the gas rate in Washington at 75 cents per 1,000 cubic feet—the Central Body concurred in the report and findings of the Committee. These in effect were the Committee unanimously declared its opposition to such a measure until such time as it was proved that the product can be manufactured and delivered for a less rate per 1,000 cubic feet for a candle power equal to that now supplied. A verbatim passage in the report is: "Labor is the greatest distributor of wealth and conservator of prosperity. The greater the wage, the more wholesome the prosperity. There has never been a time in the history of the world when financial stagnation became widespread until capital was paralyzed and labor idle. It has been our experience in times past that retrenchment in any line of industry begins with labor. We are the first to feel its heavy hand. When this occurs, the purchasing power of the laborer is reduced, which reduction affects the merchants. While the Washington Gas Light Company disclaims any purpose of reducing wages in the event of the Madden bill becoming a law, yet we are compelled to take such a statement for what it is worth. Past experiences are to be remembered when considering a proposition of this character." The report in extenso was published in the issue of the Washington *Post*, dated January 29th.

PRESIDENT L. C. HAMLINK, of the Gas Bench Construction Company' of St. Louis, reports that his concern is getting its fair share of work, and in proof thereof he cites the following contracts recently entered on the Company's books: Three benches of 6's for Ottumwa City, Ia.; two benches of 6's for Michigan City, Ind.; one of 6's for Wausau, Wis.; and one of 6's for Alpena, Mich.; also, all the linings for the two 10-foot water gas sets to be constructed at Elizabethport, N. J., and the 8-foot set for Cedar Rapids, Ia.

THE bill introduced by Mr. A. E. Smith, of New York city, in the Legislature, is for the purpose of amending the statutes respecting the number of signatures required to bring the attention of the Commission of Gas and Electricity to a complaint from any center desiring a revision of the gas and electric lighting rates therein, or an examination as to the quality of gas supplied:

Number of Complainers.		Population.
Towns or villages, 25		1,000 or under
" " 50		1,000 to 5,000
" " 75		5,000 to 10,000
" " 100		10,000 or over.

MR. GALE, of Putnam, has also introduced a bill amending the act creating the Commission by providing that no municipality shall issue to any existing corporation any franchise for the manufacture and supplying of gas or electricity without a certificate stating the necessity therefor from the Commission. The Commission may inquire as to the necessity for such a franchise and as to the intention and good faith of the applicant and if satisfied that the territory within which the franchise is to operate is already supplied at a reasonable rate may refuse to issue such certificate.

MR. JOHN J. LEWIS, at one time Inspector of Mines, Ohio district, of the New York and Cleveland Gas Coal Company, died at his home in Pittsburgh, the 1st inst. He was in his 46th year, and was in his earlier life well and favorably known in the mining districts of Wales, England.

AT a special election held in Harrisonville, Mo., the 5th inst., for the purpose of determining whether or not the right to operate a gas plant in that place for a term of 20 years should be granted to Messrs. George C. Greenup and E. L. W. Merrill, the permission was carried by almost a two-thirds vote.

THE Directors of the reorganized Chattanooga (Tenn.) Gas Company have elected the following Directors: President, J. P. Hoskins; Secretary, H. A. Thornton; Treasurer, I. S. Post. The Commercial Department will be under the supervisorial charge of Mr. J. R. Hunting.

THE Borough Council of Chatham, N. J., has authorized the Public Service Corporation, of New Jersey, to put its mains through the streets. The Company at Morristown, N. J., has been trying off-and-on since 1899 to secure this "privilege."

THE authorities of Albany, Ga., who have determined to construct and operate a gas plant on municipal account, have appealed to Mayor Smith, of Macon, Ga., for information as to where they might best obtain information respecting "the details of gas works construction, and how to obtain the same." Mayor Smith didn't know, you know, and he had the courage to say so. Is it not natural to think that the place to acquire such information would be at or in the headquarters thereof? The office of the AMERICAN GAS LIGHT JOURNAL, for instance!

THE consolidation of the People's Gas Light and Coke Company, of Chicago, with the Ogden Gas Company of the same place, is announced. Under this adjustment the Ogden Company practically goes out of active business. It is also agreed upon that Mr. C. K. G. Billings will retire from the Chairmanship of the Board of Directors of the People's Company and that Mr. Geo. A. Knapp will retire from the Vice-Presidency.

ALAS! It is no longer Paul Doty to whom we may address ourselves. Hereafter his proper title is to be Colonel Doty, for such he is, through the grace of the Governor of the State of Minnesota, who has appointed Paul an Aide-de-Camp, General Staff, with the rank of Colonel. May his whiskers never grow less.

THE residents of Fullerton, Pa., are clamoring for a supply of artificial gas, and their desire is that the Allentown (Pa.) Company should give it to them.

THE Kelsey-Geist syndicate has purchased at least a 5-6th interest in the Michigan City (Ind.) Gas Company.

THE city authorities of Bridgeport (Conn.) have agreed to accept the proposition of the Bridgeport Gas Light Company, under which the latter will supply gas at the flat rate of $1 per 1,000 on and after October 1st, 1907.

MR. GEORGE N. LAWRENCE, Receiver and General Manager of the Canon City (Col.) Gas Company, died at the home of his daughter in Pueblo, Col., the morning of the 11th inst. Deceased, who was a native of Augusta, Me., was at one time engaged in business with the late Hon. James G. Blaine.

THE "tidal-wave Mayor" of Fall River, Mass.—his name is John J. Coughlin, and he is not a relative of the Chicago Alderman who bears a similar name—recently vetoed a resolution of the Board of Aldermen which directed that hereafter the gas lights in service on the public streets of Fall River be lighted from one-half hour after sunrise to one-half hour before sunrise every 24 hours in the year. His Honor, in the veto, remarked that it would be a "pure waste of money" to have all the lights in the city running full blast during the times specified. The Aldermen repassed the measure over the veto.

THE Boston Consolidated Gas Company has sold to the New York New Haven & Hartford Railroad Company a strip of land covering 3,000 square feet, lying between Bolton and West Third streets, South Boston. The price paid was $1 per square foot.

MR. JOHN F. KILGOUR has been appointed Chief Clerk of the Passaic branch of the gas service of the Public Service Corporation of New Jersey.

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, FEBRUARY 18, 1907.

The Market for Gas Securities.

The Hebraic dealers in Consolidated Gas, whose shortages therein were delicately referred to by us some weeks ago, got a New Year gift on the Stock Exchange yesterday (Thursday) when the stock managed to climb almost 7 points. The opening to-day was at 139¾ to 140. That interest by-the-way is not closed out even now. On its merits, however, as a wage-earner 175 seems only a fair figure for it. Brooklyn Union scored a rather sensational advance to 120 bid, little or no stock coming out, however.

Peoples, of Chicago, is 96 bid, ex div.; Massachusetts Gas Companies stock is at last week's rating, and Baltimore Consolidated is offered at 92. Mr. Charles H. Dickey says it is really worth par, and he should know.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

FEBRUARY 18.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	139¼	140
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000 000	1,000	98¼	100
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	120	125
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,550	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000.000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	100	100½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,095,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	.	90
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,550,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	65	65¼
Preferred	25,000,000	100	85⅛	85⅞
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	96	96¼x
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	82	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	500,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047.000	1,000	102	..
Washington, D. C	2,600,000	20	28 1⅞	285
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600.000	50	230	..

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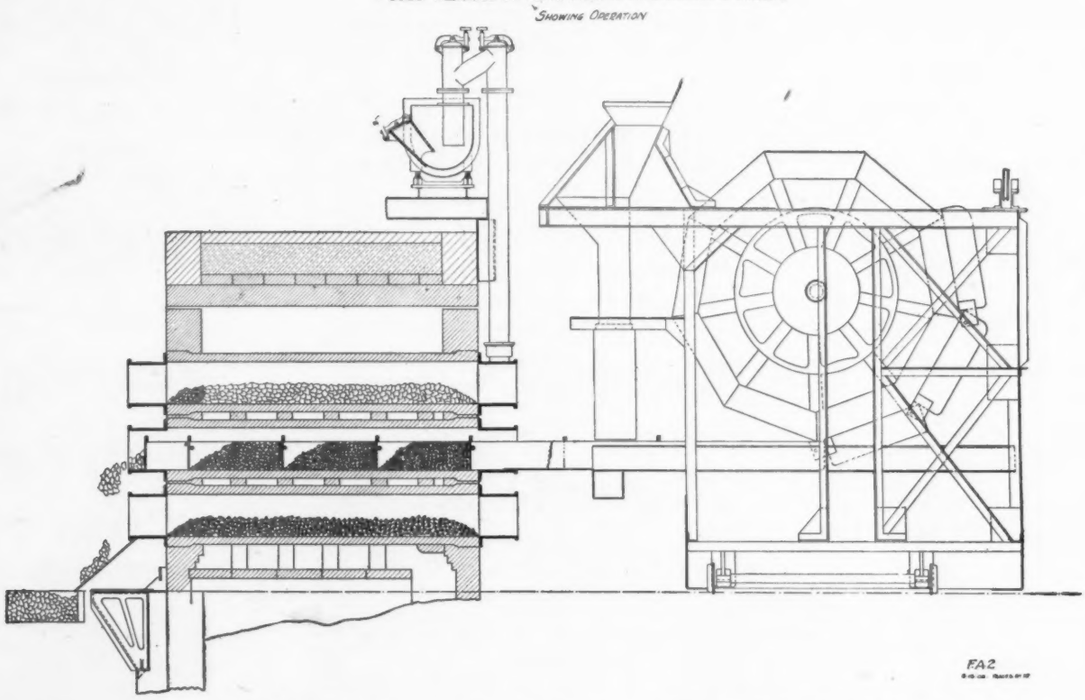

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Are made by a company that makes **more open flame** burners than **any other concern in the world.**

The makers of the **BRAY** only make burners, and, knowing how, they make the best.

When you buy **BRAY BURNERS** you buy **durability, efficiency** and **satisfaction,** both for **yourself** and your **consumer.**

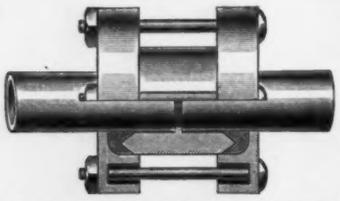
There is 40 years of experience back of every Bray Burner.

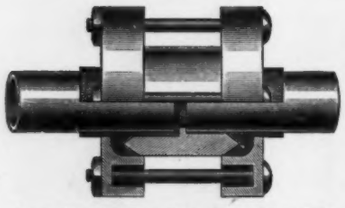
W. M. CRANE COMPANY,

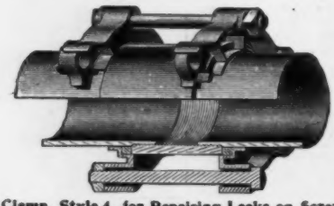
1131-33 Broadway, New York, N. Y.,

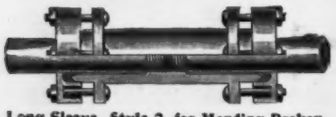
WE MAKE GAS APPLIANCES OF ALL KINDS. Sole Agents for Bray Burners in the U. S. and Canada.

Self-Lighting Burner.


Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.


Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe,


Clamp, Style 4, for Repairing Leaks on Screw Collar.


Long Sleeve, Style 2, for Mending Broken Lines.

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SUCCESSORS TO

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Patentee and Manufacturer of Specialties for Gas and Water Lines,

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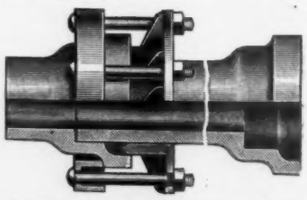
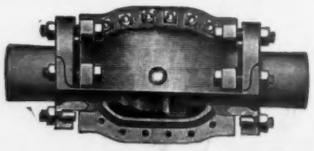
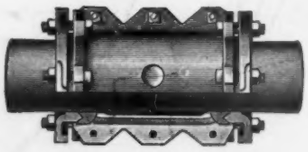
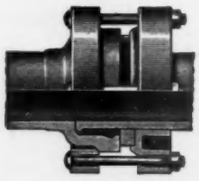

Coupling, Style 9, for Special Style Cast Iron Pipe.


Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.


Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.


Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.

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We know wherein every one of the twenty-odd imitations differ from the "Ramsdell" Inverted Gas Lamp---the "Rico" brand.

The difference in one or two cases is only slight, but it is just that difference that makes the "Ramsdell" Lamp a practically perfect and highly satisfactory lamp.

That same little difference is what will keep the "Ramsdell" Lamp popular long after the imitators are all forgotten.

It is to the interest of the gas manufacturer to have every customer understand this difference at the start.

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GAS ENGINEERS,

DESIGN, CONSTRUCT AND OPERATE COMPLETE COAL, WATER AND CRUDE OIL GAS PLANTS.

HIGH AND LOW PRESSURE DISTRIBUTING SYSTEMS.

AMERICAN TRUST BUILDING,

CHICAGO.

No. 14
Mueller Combination.

C—1002.

Mueller Gas Tapping Machines.

This machine has a detachable brass cylinder which prevents the escape of gas while making a pressure tap, and which is removed for making open taps. Especially convenient and economical for those who depend upon but one machine for both classes of work. Taps from ⅜ to 2 inches in any size of pipe.

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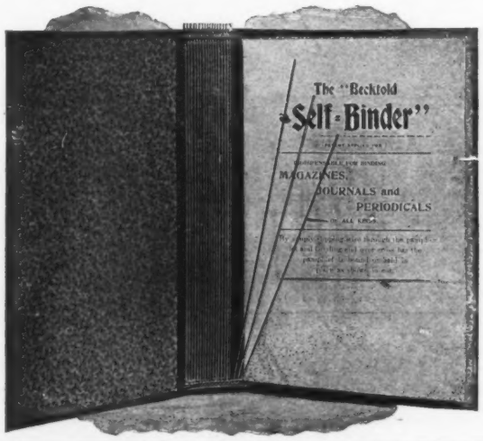
FOR THE

JOURNAL.



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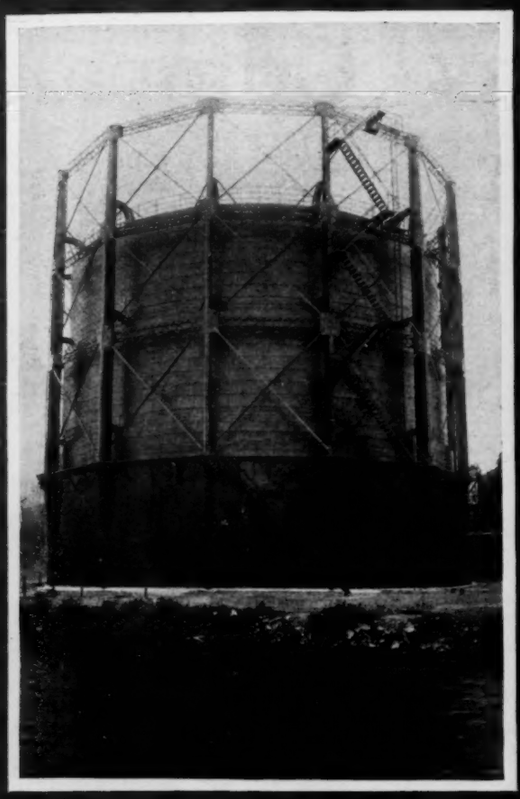
FOR SALE BY

A. M. CALLENDER & CO., - 42 Pine St., New York.



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CRUSE-KEMPER COMPANY

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TRIPLE
DOUBLE and
SINGLE-LIFT

Gas Holders

WITH OR WITHOUT
METAL TANKS

Oil and Water Tanks
Purifier Covers
General Plate Metal Work and
Steel Water Towers

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PROMPTLY FURNISHED ON REQUEST

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PRIMARY AND SECONDARY CONDENSERS FOR FRESH OR SALT WATER

MAIN OFFICE AND WORKS
BRIDGE & OGDEN STREETS
NEWARK, N.J.
ESTABLISHED 1865

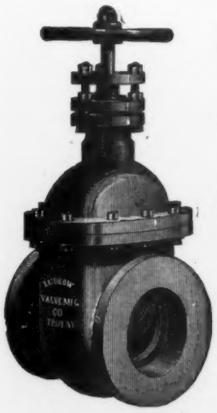
ISBELL VALVES
SPECIALS

TAR EXTRACTORS

P.&A. TAR EXTRACTORS FOR WATER GAS

ROTARY AMMONIA SCRUBBERS

SHAVING SCRUBBERS
PURIFIERS
STREET GOVERNORS



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TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

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Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

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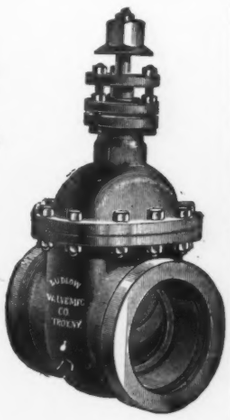

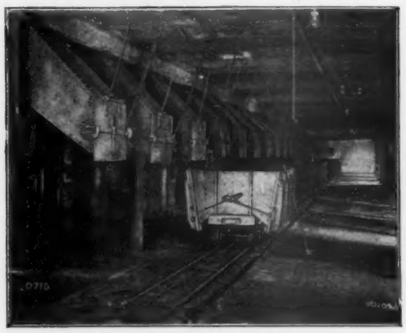

This cut shows the Hunt Cable Car handling coke (cold) which has been quenched in the Mann chute.

C. W. HUNT CO.,

FOUNDED 1872.

NEW YORK OFFICE: 45 Broadway.
MAIN OFFICE AND WORKS: West New Brighton, N. Y.

MANUFACTURERS OF

COAL and COKE HANDLING MACHINERY

AND THEIR APPURTENANCES, SUCH AS VALVES, SCREENS, etc.

Also "Industrial," Automatic and Cable Railways, including cars for unusual conditions.

Bristol's Recording Pressure Gauges

—(ALL RANGES).—

Used the World Over.

Necessary Equipment

Write for Catalogue A.

For Every Gas Plant.

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For several years associated with the late CAPTAIN WILLIAM HENRY WHITE,

WILL CONTINUE THE BUSINESS OF

CONSULTING ENGINEER

For Gas, Water and Electric Light Companies, at No. 41 Wall Street, Room 1707, New York.

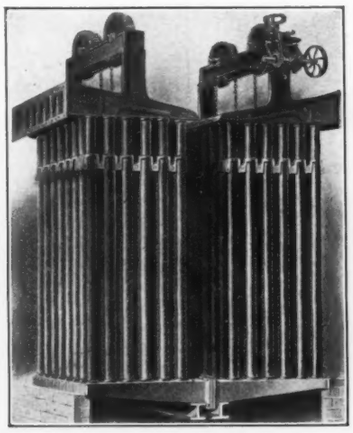
TELEPHONE, 5534 BROAD.

Modern Machine Shop Construction, Equipment and Management,

By OSCAR E. PERRIGO, M.E.

Price, $5. For Sale by

A. M. CALLENDER & CO., 42 Pine St., New York City.



HOW MUCH COAL PER 1,000 CU. FT. OF WATER GAS?

If the process of making water gas were theoretically perfect, only 24 lbs. of coal would be consumed per 1,000 cu. ft. of gas generated. As a matter of fact, the actual figures are between 40 and 48 lbs. per 1,000 cu. ft. It is apparent that there is a waste somewhere, and if you will take the trouble to put a thermometer over the stack valve during the "blowing up" period, you will see where the heat goes to. From one-third to one-half of the heat escapes to the atmosphere, either as sensible heat or latent heat of combustion. If use can be found for this heat a great economy could be effected immediately.

We have found such a use. By means of the Green Air Heater 12 per cent. to 15 per cent. of this heat, or more, can be imparted to the air blown to the generator. This will reduce the time for blowing up and increase the temperature of the generator, so that about the same proportion of coal will be saved.

After the gases have passed through the air heater they are still hot enough to use in a Green Fuel Economizer to heat the boiler-feed water up to the evaporative point. In In this way a quarter of the boiler coal can be saved. In connection with a 6-ft. generator an investment of $3,500 in an Air Heater and an Economizer will save from $2,300 to $2,500 per year. This ought to repay you for the trouble of writing us for further information. Ask for Circular "AG."

THE GREEN FUEL ECONOMIZER CO.,
MATTEAWAN, N. Y.

(Sole builders of the Green Fuel Economizer in this country; we also build Fans and Blowers.)

FOR HOT BATHS,

And for every other Hot Water Need, use the

IMPROVED

HUMPHREY CRESCENT INSTANTANEOUS WATER HEATERS.

Efficient. Compact. Durable. Every Heater Guaranteed.

No. Heaters.	Price.	Gas Supply from Meter.	Heats Gals. per Min. 50° in Temperature.	Height.	Diameter.	Shipping Weight.
Non-Contact.. 2	$10.00	¾ Inch.	2½	34⅝ Inches.	12 Inches.	70 Pounds.
Contact..... 6	20.00	¾ "	3	23¼ "	12 "	60 "
" 8	23.50	1 "	2½	24½ "	10¼ "	48 "

These prices include Safety Valves and Unions, one Bent Output Spout. For prices of fittings see our complete catalogue, "The Luxury of a Bath."

We will be glad to quote Discounts.

HUMPHREY CO., · · · Kalamazoo, Mich.

The ONLY manufacturers in the world of a complete line of Instantaneous Water Heaters.

LLOYD'S SUBMERSION WASHERS.

Maximum Efficiency,
Minimum Back Pressure,
Complete Safety.

Western Sales Agent
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LLOYD CONSTRUCTION CO., Detroit, Mich.

WHY DO GAS EXHAUSTERS

AND HIGH PRESSURE GAS PUMPS BUILT BY

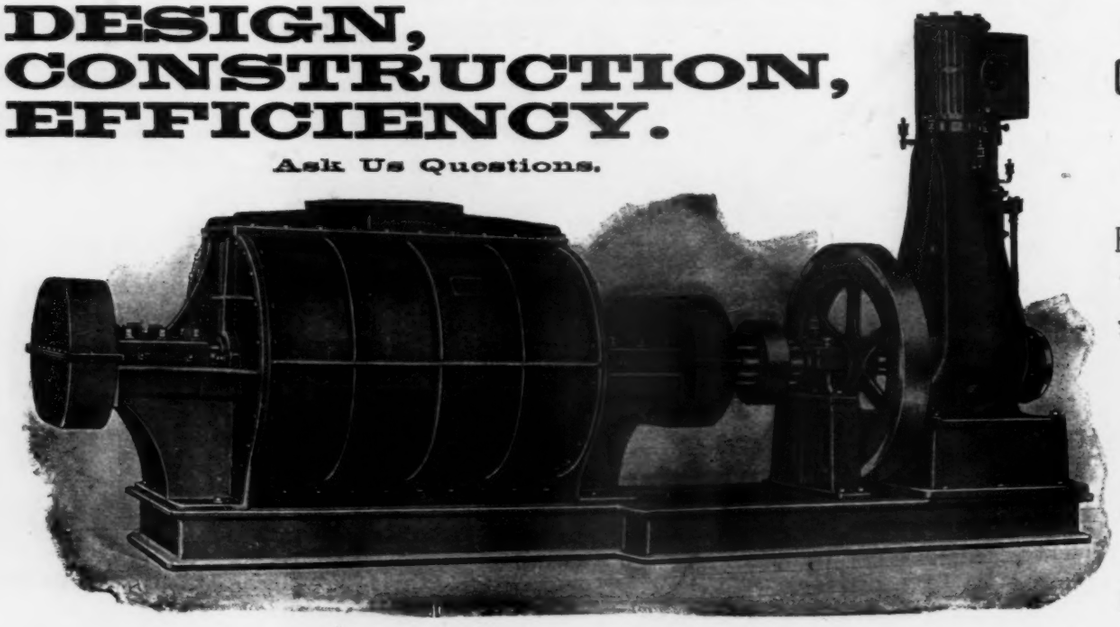
THE CONNERSVILLE BLOWER CO.

Stand so High in the estimation of those using them?

THE ANSWER IS IN THREE WORDS:

DESIGN, CONSTRUCTION, EFFICIENCY.

Ask Us Questions.



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CONNERSVILLE, IND.

Eastern Sales Agent:
HORACE G. COOKE,
95 Liberty Street,
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Write us about our Improved Stuffing Boxes.

Something Entirely New.

ROOTS' GAS EXHAUSTERS.

Installation showing our latest improved machines, with flexible rope coupling, for large units.

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Electric companies do not expect their arcs to operate without skilled supervision.

The Gas Company that uses Humphrey Arcs and looks after them as faithfully will find its competition worries materially lessened.

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DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

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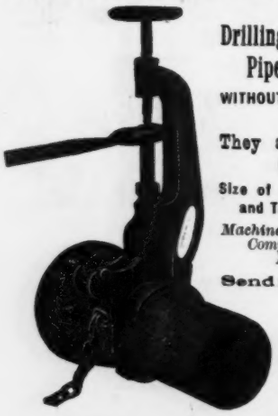

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

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Machines Sent to any Gas Company for Thirty Days' Trial.

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THOUSANDS IN USE WITH INCANDESCENT BURNERS.

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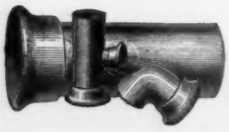

CAST IRON WATER AND GAS PIPE,

From Three to Forty-Eight Inches Diameter. Also, all Sizes of

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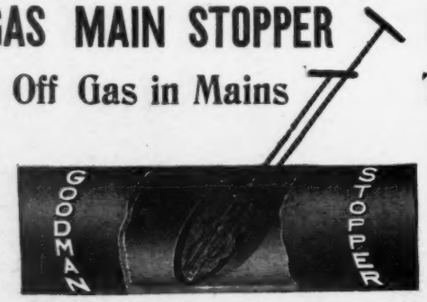
SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :



Temporarily during alterations and repairs. : : : :

STOPPERS SENT ON TRIAL.

Address: SAFETY GAS MAIN STOPPER CO., 552 E. 135th St., New York City.

Chollar's System of Gas Purification.

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

Practical Handbook on

GAS ENGINES,

With Instructions for Care and Working of the Same,

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Price, $1. For Sale by

A. M. CALLENDER & CO.,
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Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50.
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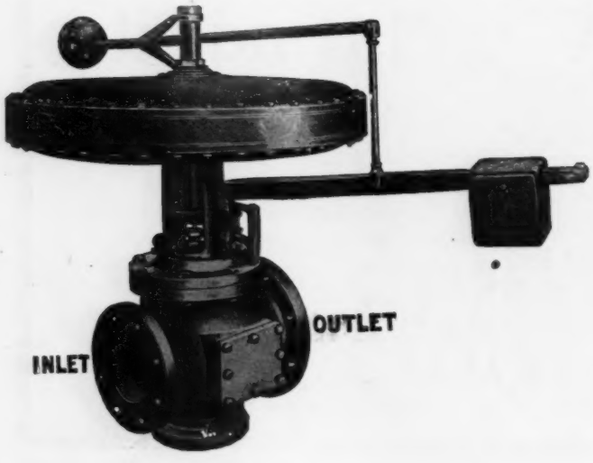

THE FULTON GAS PRESSURE GOVERNOR,

WITH AUTOMATIC SAFETY CUTOFF.

For Artificial or Natural Gas.
For District or Service Use.

Our DUPLEX SENSITIVE GOVERNOR, with Automatic Cutoff for district service, will reduce high pressure gas to inches of water without variation.

Absolutely safe and reliable. No complicated mechanism to get out of order. More than 20 years' experience with the largest gas companies.

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AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

MARCH, 1907.

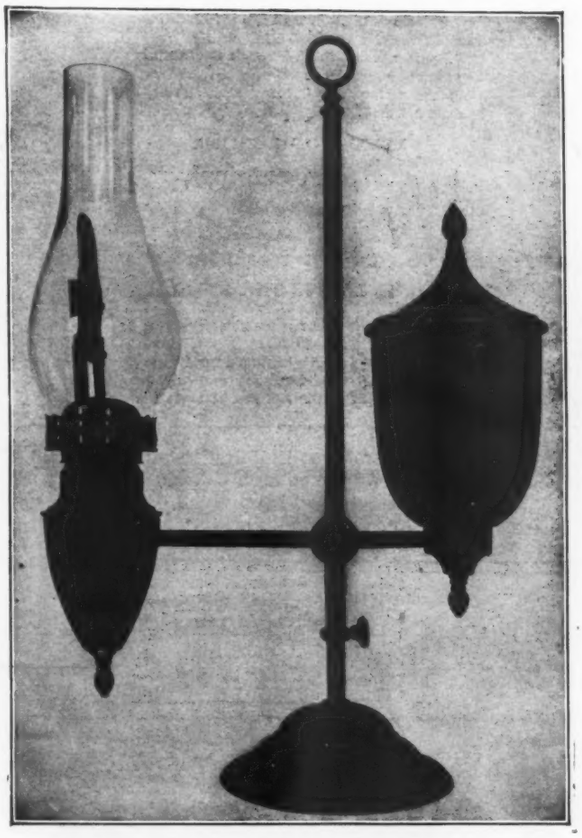
Table No. 1.
FOLLOWING THE MOON.

Day of Week.	Date.	Light.	Extinguish.
Fri.	1	6.20 PM	8.30 PM
Sat.	2	6.20	9.30
Sun.	3	6.30	10.40
Mon.	4	6.30	11.50
Tue.	5	6.30	12.50 AM
Wed.	6	6.30 LQ	2.00
Thu.	7	6.30	3.10
Fri.	8	6.30	4.10
Sat.	9	6.30	5.10
Sun.	10	6.30	5.20
Mon.	11	6.30	5.20
Tue.	12	6.30	5.20
Wed.	13	6.30 NM	5.20
Thu.	14	6.30	5.20
Fri.	15	6.30	5.20
Sat.	16	6.30	5.20
Sun.	17	6.40	5.10
Mon.	18	9.50	5.10
Tue.	19	10.40	5.10
Wed.	20	11.40	5.10
Thu.	21	12.30 AM PM	5.10
Fri.	22	1.20	5.10
Sat.	23	2.10	5.10
Sun.	24	2.50	4.50
Mon.	25	3.30	4.50
Tue.	26	4.00	4.50
Wed.	27	4.30	4.50
Thu.	28	No L.	No L.
Fri	29	No L PM	No L.
Sat.	30	No L.	No L.
Sun.	31	6.50 PM	9.40 P M

TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20



THE ELLIOTT KEROSENE STANDARD PHOTOMETER LAMP.

***

10-Candle Power.

***

This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

1st. It uses Standard Kerosene Oil (Pratt's Astral Oil or equivalent).

2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

MARCH, 1907.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Light.	Extinguish.
		P. M.	A. M.
Fri.	1	5.30	5.45
Sat.	2	5.30	5.45
Sun.	3	5.30	5.45
Mon.	4	5.30	5.45
Tue.	5	5.40	5.35
Wed.	6	5.40	5.35
Thu.	7	5.40	5.35
Fri.	8	5.40	5.35
Sat.	9	5.40	5.35
Sun.	10	5.40	5.35
Mon.	11	5.40	5.35
Tue.	12	5.50	5.20
Wed.	13	5.50	5.20
Thu.	14	5.50	5.20
Fri.	15	5.50	5.20
Sat.	16	5.50	5.20
Sun.	17	5.50	5.20
Mon.	18	5.50	5.20
Tue.	19	6.00	5.10
Wed.	20	6.00	5.10
Thu.	21	6.00	5.10
Fri.	22	6.00	5.10
Sat.	23	6.00	5.10
Sun.	24	6.00	5.10
Mon.	25	6.00	5.10
Tue.	26	6.10	4.55
Wed.	27	6.10	4.55
Thu.	28	6.10	4.55
Fri.	29	6.10	4.55
Sat.	30	6.10	4.55
Sun.	31	6.10	4.55

TOTAL HOURS DURING 1907.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

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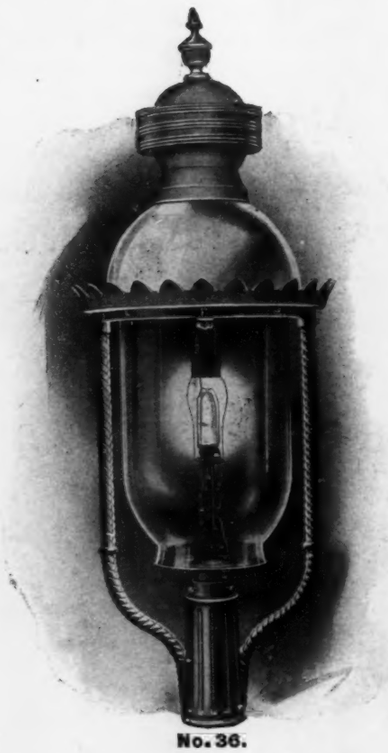

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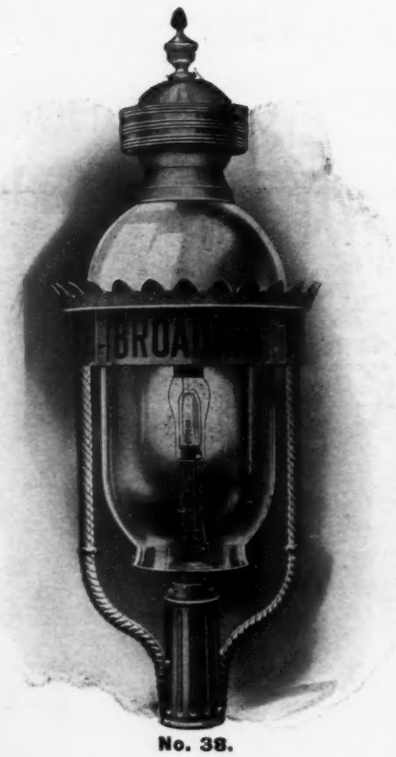

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Davenport, Ia.
S. Brooklyn, N. Y. (3d contract).
Delray, Mich.
Albert Lea, Minn. (2d contract).
Leominster, Mass. (2d contract).
Clinton, Mass.

TOTAL SETS INSTALLED IN 1906, ... 41
TOTAL SETS TO DATE, ... 634
TOTAL DAILY CAPACITY, ... 502,555,000 cu. ft.

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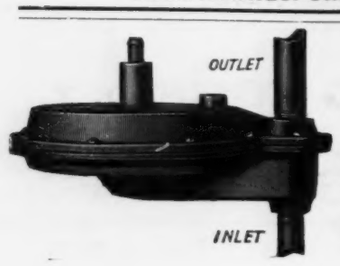

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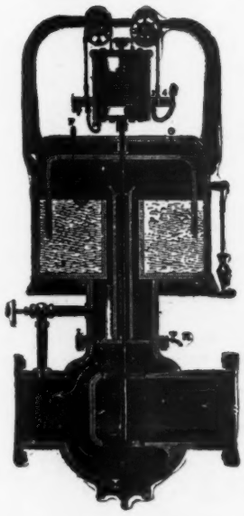

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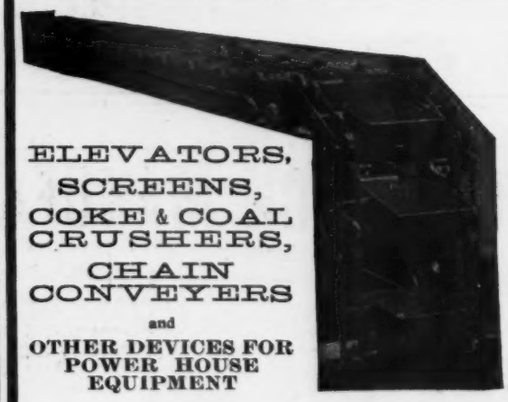

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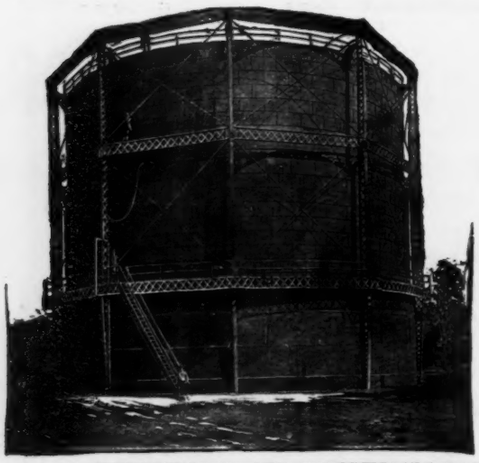

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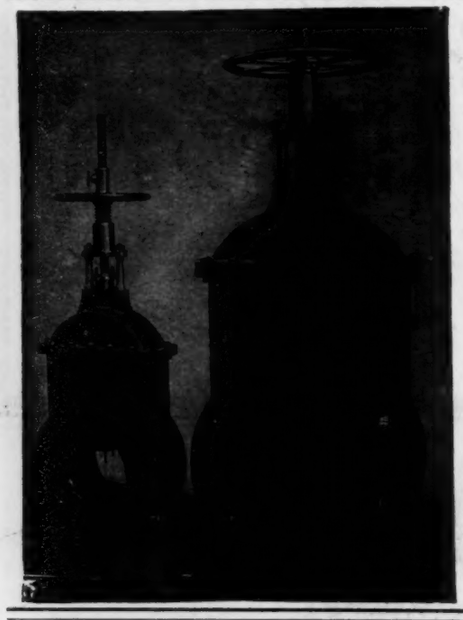

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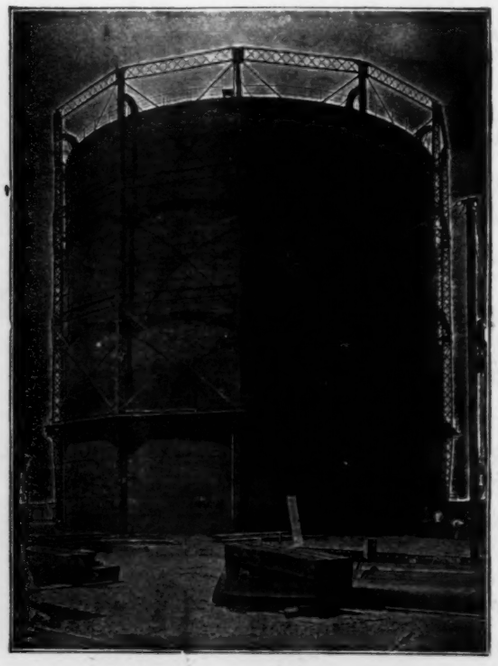

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